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THE CONSERVATIVE SURGICAL TREATMENT OF CERTAIN RENAL LESIONS

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PERHAPS in no other field of surgery has there been a more pronounced trend toward conservatism in recent years than in the practice of urology. There can be mentioned conservative plastic procedures for hydronephrosis, the manipulative removal of ureteral stones, and the avoidance of open operations for the treatment of stones in the bladder, neoplasms of the bladder, and vesical neck obstructions. In the realm of renal surgery, conservation of a kidney may prove to be a much more difficult technical procedure than nephrectomy and under certain circumstances a particular conservative operation may be performed by one surgeon with reasonable safety while the same procedure in the hands of another might be extremely hazardous. In this respect I can speak with assurance because I have failed in some instances where I am sure another might have succeeded. In the surgical treatment of the solitary kidney, whether acquired or congenital, conservatism becomes a necessity. One is enforced to preserve the organ. My first experience with plastic correction of hydronephrosis was enforced under such circumstances. The problem was that of a gradually increasing hydronephrosis in a young woman in whom there proved to be a congenital absence of the opposite kidney. During several months of observation, the capacity of the hydronephrosis had gradually increased to 240 c.c. and it was very evident that unless the obstructive factor could be abolished, her life expectancy was limited by weeks, or perhaps a few months. Exploration revealed a valvular

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type of obstruction for which a lateral anastomosis was performed with a very satisfactory result; in fact, twelve years have elapsed since the operation, during which time she has experienced excellent health, and is still enjoying the activities of a normal life. In the treatment of pathologic conditions involving the hidden organs such as the kidneys, the ovaries, and the fallopian tubes, the extirpation of one of them may be easily accomplished, but in many instances the question may be raised if the removal of the organ might not have been reasonably avoided. If there were external evidence of the loss of a structure, as in instances of the removal of an eye, or the amputation of an extremity, the desirability of conservatism would be much more apparent. Strictly speaking, conservation of the kidney, a vital organ, should be on the same plane. If this conservative attitude is adopted in the surgical treatment of certain renal lesions, there is hardly a doubt that the incidence of nephrectomy would be considerably lessened. Although conservation of renal tissue becomes a necessity in dealing with the solitary kidney, why should not these same principles apply in the treatment of unilateral lesions, even though on the urologic survey the opposite kidney may prove to be sound?

Hydronephrosis

Hydronephrosis of the noncalculous type comprises one of the most attractive fields for the practice of conservative renal surgery. In our experience the most common causes of obstruction have been aberrant vessels, high insertion of the ureter forming a valvular type of obstruction, fibrosis at the ureteropelvic juncture, and fibrotic bands causing partial occlusion of the upper ureter. Formerly nephrectomy was regarded as the operation of choice in these cases but during the past twenty years our knowledge of the problem has increased with particular reference to conservative surgical management; mention might be made of the contributions of Fenger, Schwyzer, von Lichtenberg, Quinby, and more recently Walters, Foley, and others. The diagnosis of hydronephrosis of this type may not be easy. The preliminary plain film of the region of the urinary tract and the urinalysis both may be negative and may thus comprise misleading data. The urologic examination usually will reveal a high obstruction, the nature of which remains obscure until the exploration. It may be stated further that the functional data regarding the involved kidney may not be dependable inasmuch as the excretion of dye may be essentially normal, but it accumulates in the hydronephrotic sac and may give the impression of absence of function. If the ureteral catheter, however, is left in situ for a period of twenty-four hours or longer, and the test re-

peated, it is surprising how often reserve function may be demonstrated. If this is not done, and good renal substance is demonstrated at the exploration, a conservative operation should be seriously considered. The selection of cases suitable for conservative treatment requires a nicety of judgment. In elderly patients nephrec-

Fig. 1. A. Right calculous pyonephrosis without demonstrable function and left noncalculous hydronephrosis. Note retention of much of the medium as evidenced by delayed film (fifteen minute).

B. Postoperative pyelograms obtained seven years following pelviolithotomy and left pyelo-ureteroplasty; both pyelograms approach normal in outline. Note evidence of good emptying in delayed film (ten minute).

tomy may be the operation of choice as pointed out by Walters. In children, and in women during the child-bearing age, conservatism should be practiced wherever possible. In men whose ability to work is highly important, and in whom the opposite kidney proves to be sound, nephrectomy may be more desirable because plastic surgery, as revealed by a critical review of large series of cases, incurs the prospect of failure in approximately 20 per cent of the cases. The following important principles should govern their management: (1) Each presents an individual problem which must be dealt with on the basis of the obstructive factor discovered at operation. Perhaps in no other field of surgery must the surgeon be more resourceful than in the measures adopted at the operating table, because no preconceived plans or specifications can be followed. (2) If aberrant vessels are found, their light compression by rubber protected forceps will bring about a discoloration of that portion of the kidney involved and will serve to indicate whether the vessel should be divided or conserved. Usually if the vessels are small, their ligation and division may be safely accomplished. If the vessels are large, however, it may be necessary to sever and

reimplant the ureter. In some instances the hydronephrotic sac can be resected in such a way that reconstruction will serve to draw the pelvis away from the vessels and prevent a recurrence of the obstruction. (3) High insertion of the ureter usually necessitates a lateral anastomosis of the ureter with the renal pelvis or the performance of Foley's modification of the Schwyzer "Y" operation, which in our experience has been employed with almost uniformly good results. (4) If the hydronephrotic sac is large, its partial resection is desirable because of the prompt elimination of stasis; this in turn promotes the early relief of infection. (5) Subepithelial fibrosis, or congenital hypertrophic obstruction at the ureteropelvic juncture, may be compared to congenital pyloric obstruction in the newborn, and the application of the Rammstedt type of operation, as advocated by Davis and later by Vose, would be the operation of choice. (6) When the obstructive factor has been overcome, a temporary nephrostomy is an advantage, as suggested by von Lichtenberg. (7) Ormond, Cabot, Priestley, and others have called attention to the advisability of leaving a splinting catheter for several weeks through the site of the ureteropelvic anastomosis in addition to the nephrostomy drainage. These measures seem to prevent the contraction of scar tissue and improve the prospects of permanent relief from the obstruction. (8) The use of the sulfonamides immediately before and after the operation as a prophylactic, and also powdered sulfanilamide liberally applied to the region of the plastic operation and the open incision, serve to control infection and promote primary healing. (9) In those cases in which ptosis is a factor, a nephropexy should be performed after completion of the plastic procedure. (10) Continuity of the ureter should be preserved whenever possible. (11) In the reconstruction of the pelvis and in those cases in which a lateral anastomosis is performed, as few stitches as possible for the accurate approximation of mucous membrane to mucous membrane is desirable. It has been our custom to employ triple 0 chromic catgut for interrupted sutures, except where extensive reconstruction of the hydronephrotic sac is made, when a running suture is permissible.

Recently we have reviewed the late results obtained in eighteen instances of noncalculous hydronephrosis. The follow-up data were obtained from 7 months to 13 years after the operation. In six the operation was of necessity because of a solitary kidney in two, the disease was bilateral in two, the opposite kidney required removal in one because of a malignant renal tumor, and in another the opposite kidney was pyonephrotic from an obstructing calculus (fig. 1). In the remaining twelve cases the operation was one of choice or election. In this group there was no mortality. There were two failures, however, with a secondary nephrectomy, one after three

months, and another after one year. In another case for a period of five years the result was considered excellent but a large branched stone formed, accompanied by marked impairment of function, and a nephrectomy was performed six years later. The most favorable end results were obtained in instances of high insertion of the ureter

Fig. 2. A. Excretory urogram disclosing bilateral renal duplication. The lower segment of right kidney was functioning only slightly and involved with a gonococcal pyonephrosis; heminephrectomy.

B. Postoperative excretory urogram seven months following operation. Note good function and essentially normal outline.

in which either a lateral anastomosis or the Foley type of "Y" operation had been performed. In ten such cases there was only one failure. Of six cases in which aberrant vessels apparently were causing obstruction, in four in which simple division and ligation of the vessels was performed, the late results were somewhat disappointing when judged by the postoperative pyelographic evidence, but in the remaining two cases in which the ureter was reimplanted, with or without division of the vessels, the results were more encouraging. In one instance of fibrosis at the ureteropelvic juncture a good result was obtained from a Rammstedt type of operation. It was of interest to note that in all of the cases in which a prolonged period of ureteral splinting and nephrostomy drainage was employed, usually for a period of at least six weeks, the results were uniformly satisfactory. The importance of these measures cannot be over-emphasized.

Heminephrectomy

In instances of renal duplication where disease is confined to one segment, it may be desirable to preserve the healthy portion. This

type of conservative renal surgery may not only be indicated but feasible. For example, in 1936, a functionless gonococcal pyonephrosis was discovered involving the lower half of a completely duplicated right kidney in a youth of 17 years of age. Of further interest also was complete renal and ureteral duplication on the opposite side; in other words, there were four ureters and double kidneys on both sides. The pyonephrotic lower half of the right kidney was resected. The patient made an uneventful recovery and the postoperative check-up disclosed the upper segment to be healthy and functioning normally (fig. 2). The patient has remained well and without evidence of recurrence of the disease, the stubborn infection having disappeared promptly upon removal of the pyonephrotic lower segment of the right kidney. Case reports of heminephrectomy are not uncommon in the literature. This type of conservative operation should be remembered when dealing with a duplicated kidney with a surgical lesion involving one segment. Malignancy and tuberculosis are exceptions requiring total sacrifice of the organ.

In the surgical management of renal duplication the blood supply of the healthy segment is preserved with extreme care. A wedge-shaped incision is made into the healthy segment and reconstruction is carried out in such a way that the pelvic mucous membrane is brought together accurately, then the renal cortex with either a segment of fat or muscle tissue included in the closure for the purposes of effective hemostasis. The Deming type of nephrotomy closure has been employed with satisfactory results.

Partial Resection of a Kidney

In calculous disease occasionally there may be an extreme degree of atrophy of the renal parenchyma at one of the poles, usually the lower, constituting a stagnant pocket which is disposed to become a factor in the reformation of stones. If the remainder of the kidney is worthy of conservation, the removal of that area involved in stasis is indicated. In several such cases we have usually employed an electrode and cutting current for division of the renal parenchyma after applying rubber protected intestinal forceps to the renal pedicle for the control of hemorrhage. Repair is effected in much the same way as mentioned in heminephrectomy, and with the same precautions regarding hemostasis.

Pyonephrosis

The term pyonephrosis usually signifies a kidney in which the pelvis and calices are filled with thick pus, as occasionally occurs in the terminal stage of an infected hydronephrosis, or as is more

commonly seen, in neglected calculous disease. As a rule there is no demonstrable function and usually a nephrectomy has been regarded as necessary. In our experience, however, if a large caliber ureteral catheter is left in at the preliminary examination, it is surprising to observe that within a few days the drainage becomes

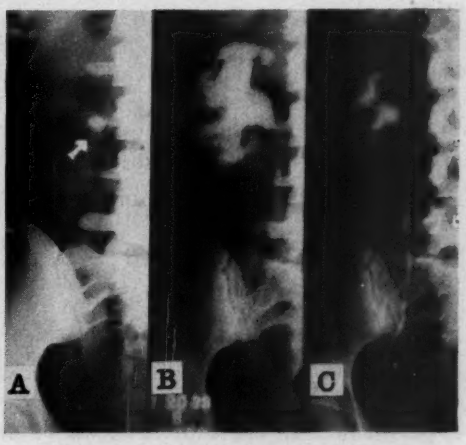

Fig. 3. A. Plain roentgenogram. Note shadow of calculus opposite third lumbar vertebra.

B. Retrograde pyelogram revealing inclusion of shadow at renal outlet and irregular, eroded pyelographic outline characteristic of pyonephrosis; pyeliolithotomy and temporary nephrostomy.

C. Postoperative pyelogram obtained thirty-eight days after operation. Note essentially normal outline.

essentially clear and in many instances there will be a return of function of sufficient degree to warrant conservation of the organ. For example, a woman aged 29 years, complained of pain in the right loin of three months' duration, due to a stone 1.5 cm. in diameter, blocking the upper right ureter at the level of the third lumbar vertebra. The obstruction was passed with difficulty by a No. 9 F. catheter and 63 c.c. of thick pus aspirated. The catheter was left in place and 48 hours later the urine was only hazy in appearance, the output had steadily improved, and phenolsulfonphthalein injected intravenously appeared after four minutes with an output of 9 per cent in fifteen minutes. Upon this demonstration of reserve function, the stone, which had been pushed back into the renal pelvis, was removed by a pyelotomy and a semipermanent nephrostomy established by inserting a catheter through the lower calix. The recuperative ability of this kidney was remarkable. The preoperative and postoperative pyelograms obtained in this case are illustrated by fig. 3. It will be noted that the postoperative pyelogram made thirty-eight days later is essentially normal. A limited

number of cases of this type have furnished convincing evidence of the recuperative ability of a kidney. Such experiences have prompted us to maintain a conservative attitude toward pyonephrosis and to reserve nephrectomy for those cases in which there is no demonstrable return of function after a reasonable period of catheter drainage.

When a pyonephrosis is encountered as a terminal stage of an infected hydronephrosis, the management of the case is essentially the same; that is, if the urine becomes fairly clear, and there is a demonstrable return of function, the kidney is explored with a view of doing a conservative plastic operation to abolish the obstructive factor and a semipermanent nephrostomy is performed. It is important that the nephrostomy tube be worn for a sufficient length of time to permit definite control of the infection before this type of drainage is terminated.

Multiple Renal Calculi and Large Branched Stones

Numerous small stones scattered throughout the calices and large branched stones comprise two conditions for which a nephrectomy occasionally is performed. In our experience, however, we have removed as many as 55 stones from the kidney and also large branched stones of sufficient size to require fragmentation, and have thus preserved a kidney which otherwise might have been sacrificed. Under such circumstances, it is important that all calculi be removed, and unless the precaution is taken to expose a film or enlist the aid of a fluoroscopist at the operating table, stones and small fragments can be easily overlooked; in fact, a good percentage of so-called "recurrences" are undoubtedly due to incomplete removal of calculi. Your attention is directed to the case of a woman, aged 59 years, who had experienced five severe attacks of left renal colic during a period of eighteen months. The attacks were associated with extreme and prolonged nausea and as far as she knew a stone had not been passed. Roentgen examination of the region of the urinary tract revealed a group of small, closely set shadows in the region of the left kidney. An excretory urogram disclosed that these shadows were included in the outline of the renal pelvis in a kidney of fairly good function. It was also evident that the kidney was hydronephrotic due to an obstruction at the ureteropelvic juncture; otherwise many of these small stones might have made their exit down the ureter. Exploration revealed a high insertion of the ureter and valvular type of obstruction which was corrected by a lateral anastomosis and partial resection of the renal pelvis. Fifty-five stones were removed from the pelvis and calices and a film of the exposed kidney was reported negative. A temporary nephrostomy

and ureteral splint were employed. Convalescence was satisfactory and during a period of seven years there has been no return of stones nor of pain (fig. 4).

Large branched stones involving both kidneys are not always subjected to immediate surgery, especially in those cases in which

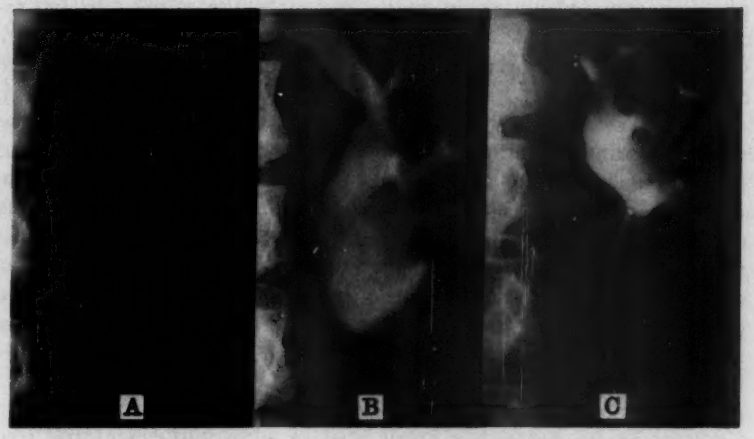

Fig. 4. A. Plain roentgenogram revealing multiple closely set shadows in left renal area.

B. Excretory urogram disclosing inclusion of shadows and evidence of obstruction at ureteropelvic juncture; ureteropyeloplasty with removal of fifty-five stones.

C. Postoperative pyelogram obtained six years following operation. There was no evidence of stasis and the function was normal.

the stones are recurrent. It is surprising how little discomfort some of these patients suffer and in the absence of severe and repeated renal colic, hematuria, and active renal infection, it has been our custom to keep these patients under observation and because of the increased hazard to defer surgical treatment until there is evidence of moderate damage to renal function or active infection. In some instances of this type not until four or five years had elapsed were there definite indications for clearing the kidneys of the stones. In such cases it has been our practice to operate first on the side in which the function is better and as soon as the patient's condition is favorable the opposite kidney is operated upon. Sometimes at the second operation a nephrectomy is indicated if there has been an extreme degree of renal damage; otherwise the kidney is conserved. The same principles are observed in cases in which a large branched stone is found in a solitary kidney in which conservative treatment obviously is a necessity. In those cases, however, in which such a stone is found in one kidney and the opposite kidney is sound, conservatism should be practiced, although not enforced in the same

degree. If a nephrectomy is performed, the opposite kidney may later become involved with stone formation, and only those patients in whom the kidney is pyonephrotic or hopelessly without function should be subjected to nephrectomy.

Large branched stones frequently require a combined pelvionephrolithotomy although in many instances the stone can be reduced to fragments and removed piecemeal through a pyelotomy opening. Decapsulation of the kidney is carefully avoided as the capsule can be utilized to advantage in the closure of a nephrotomy opening. We have preferred the Deming method of closing the renal cortex and often this is reinforced by the use of ribbon catgut tied about the kidney, as suggested by Lowsley. A temporary nephrostomy is almost a routine measure in these cases as it converts the renal pelvis from a closed into an open cavity and permits direct treatment of the accompanying infection over as long a period as necessary without subjecting the patient to frequently repeated pelvic irrigations, employing the cystoscope. If the accompanying infection is of the urea-splitting type, such as those caused by the bacillus proteus, the sulfonamides are prescribed in intensive courses. In cases in which calculi prove to be of alkaline composition, we have used either acetic acid or phosphoric acid for irrigations, and have also endeavored to maintain a high hydrogen ion concentration of the urine by placing the patient on an acid-ash diet augmented if necessary by medication designed to increase the degree of acidity of the urine. We have adopted the conception that nephrolithiasis is a symptom rather than a disease and that there is an underlying factor which should receive the most careful investigation. Every conceivable effort is made to discover the cause of stone formation. The surgeon should be just as eager to prevent the recurrence of stones as to free the organ of those present. Calculi are routinely subjected to chemical analysis which may give a clue to the etiologic factor. The bacterial flora of the involved kidney is studied, foci of infection are investigated, and estimations of the content in the blood of uric acid, calcium, and phosphorus are obtained. Adequate vitamin intake is insisted upon with particular reference to vitamin A. Stasis may be an important factor and sometimes requires partial renal resection. In instances of hydronephrosis of the extrarenal type, plastic procedures on the renal pelvis may be of extreme importance in the prevention of recurrence of stone. If one succeeds in sterilizing a kidney which had been infected with a urea-splitting organism, he will have accomplished much toward the prevention of recurrent lithiasis. The occasional discovery of such unusual causes as hypercalcemia, secondary to a parathyroid adenoma, should induce the surgeon to be constantly on the alert for this possibility. It should be remem-

bered that approximately 75 per cent of patients having a parathyroid adenoma also suffer from renal stones. These calculi are usually of calcium phosphate composition. There is probably no more satisfying experience in the realm of urologic surgery than to observe the dramatic recovery of one of these patients who has suffered for years from recurrent lithiasis and to note the rapid return to normal of the values for blood calcium and phosphorus and to gain from the lapse of time the definite assurance that there will be no recurrence of stones.

SUMMARY

Conservation of the kidney should be practiced whenever possible and nephrectomy performed only in those cases not amenable to conservative management.

The indications and principles involved in the conservative management of noncalculous hydronephrosis are discussed along with the end results in eighteen cases.

In the treatment of surgical conditions involving one segment of a duplicated kidney, a heminephrectomy often is the operation of choice.

Partial resection of a kidney should be practiced whenever a limited area can be removed with preservation of an otherwise healthy organ, except when dealing with malignancy or tuberculosis.

Pyonephrosis often responds favorably to drainage treatment either by catheter or nephrostomy unless an advanced degree of damage to the renal parenchyma has occurred. The best guide for the selection of suitable cases for conservation is the functional condition of the organ as determined by dye tests after a period of drainage.

Instances of unilateral nephrolithiasis even though extensive should be dealt with conservatively if possible although nephrectomy might be the easier technical procedure. Large branched stones or multiple stones involving both kidneys or a solitary kidney demand the most careful conservative management.

Measures directed toward the prevention of the recurrence of stone formation are of equal importance to the removal of stones. In all cases the underlying etiologic factor should be investigated with special reference to stasis, the infecting organism, vitamin intake, foci of infection, and calcium metabolism.

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REFERENCES.

1. Cabot, H.: Discussion. Proc. Staff Meet., Mayo Clinic *12:* 282, 1937.
2. Davis, D. M.: New Methods for Performing Ligatures of the Vas Deferens and for Relief of Ureteral Stricture, Urol. & Cutan. Rev. *27:* 673-674, 1933.

3. Foley, F. E. B.: A New Plastic Operation for Stricture at the Ureteropelvic Junction: Report of 21 Cases, J. Urol. *38:* 643, 1937.
4. Moore, T. D.: Congenital Solitary Hydronephrotic Infected Kidney; Pyeloureteroplasty, J. Urol. *27:* 581, 1932.
5. Moore, T. D.: The Diagnosis and Management of Hydronephrosis Secondary to Ureteropelvic Obstruction of the Noncalculous Type, Am. J. Surg. *37:* 101-115, 1937.
6. Moore, T. D.: Nephrolithiasis and Hypercalcemia Secondary to Parathyroid Adenoma: Case Report, Memphis M. J. *11:* 37, 1936.
7. Ormond, J. K.: Unsuccessful Plastic Operations for Hydronephrosis, J. Urol. *36:* 512-531, 1936.
8. Quinby, W. C.: Plastic Surgery of the Renal Pelvis, J. A. M. A. *89:* 841, 1927.
9. Quinby, W. C.: Factors Influencing the Operative Procedure in Hydronephrosis, J. A. M. A. *93:* 1709, 1929.
10. Schwyzer, A.: New Pyelo-ureteral Plastic for Hydronephrosis, S. Clinics N. Amer. *3:* 1441, 1923.
11. von Lichtenberg, A.: Plastic Surgery of the Renal Pelvis and Ureter, J. A. M. A. *93:* 1706, 1929.
12. Vose, S. N.: Hydronephrosis due to Subepithelial Fibrosis; Treatment by Adaptation of Rammstedt's Technic, New England J. M. *210:* 786, 1934.
13. Walters, W.: Resection of the Renal Pelvis for Hydronephrosis; Its Complications and Results, Surg., Gynec. & Obst. *51:* 711-716, 1930.
14. Walters, W.: Indications for and Results of Conservative Operations on the Kidneys, J. A. M. A. *95:* 1335-1337, 1930.
15. Walters, W.; Cabot, H., and Priestley, J. T.: Operative Results in Non-Calculus Hydronephrosis: Results in 71 Plastic Operations, J. Urol. *38:* 688-693, 1937.

AIDS IN THE DIAGNOSIS OF ACUTE SURGICAL CONDITIONS OF THE ABDOMEN

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THE purpose of this paper is to call attention to several infrequently practiced physical aids in the diagnosis of acute abdominal conditions. With few exceptions, no originality is claimed for the description of these signs, but an attempt is made here to emphasize those that have proved of distinct value in abdominal diagnosis. Their presence in certain acute lesions of the abdomen, and their value in the diagnosis of these lesions, have been verified by several years of personal close observation of many patients, and by the observations of many writers in the surgical literature. Only a few references will be cited.

Although primarily concerned with physical signs, this paper could hardly fail to mention the significance of an accurately taken history in the diagnosis of abdominal lesions. Certainly the history is of equal if not of far greater importance in correct diagnosis. If no opportunity were afforded the surgeon to examine a patient suspected of having an acute appendicitis, a correct diagnosis could be made in at least 50 per cent of the cases by a carefully elicited history. The importance of this is all too frequently not grasped by the examining physician, who, in his eagerness to make a rapid diagnosis, will approach the patient with an examining hand to his abdomen, or a white blood pipette to his finger. This is emphasized to a greater extent in the clinical diagnosis of a ruptured ectopic pregnancy. For here, the diagnosis is actually given to the doctor by the patient if he would but listen to the patient's story. Certain it is, that in all these conditions, a carefully taken history, well interpreted, will be of inestimable value, and more than recompense the physician for the time consumed in its eliciting.

Likewise, no attempt will be made to list all physical signs present in these abdominal lesions. Only those signs which have been found of distinct value, yet have been infrequently practiced and emphasized, and which in themselves lead to a correct diagnosis, will be here described. For greater detail, reference should be made to the quoted monographs.

A few words to describe the meaning of several signs and the method of eliciting them are in order. One of the most important signs in aiding to localize the particular organ responsible for the symptoms of the "acute abdomen," is the localization of the point of maximal tenderness. One carefully presses against the abdominal wall at various points with the gentle pressure of one finger, until

the point is found that causes the greatest amount of discomfort and elicits the greatest amount of pain. This point is anatomically specific for particular organs involved and varies but little with the size and configuration of the abdomen, or even with the normal or abnormal position of the particular organ. It is a sign that could be easily elicited if gently applied in a cooperative patient, and it more than compensates the examiner for the time spent in its elicitation.

Rebound tenderness is made evident by gentle pressure against the abdominal wall to a depth the underlying muscles will allow, and then suddenly releasing the hand from the abdominal wall. If the pain and discomfort produced by the sudden release is great and more severe than the discomfort caused by the inward pressure of the hand, the sign is declared to be positive. A positive sign is an indication of involvement of the overlying parietal peritoneum by the inflammatory, chemical or traumatic irritant. The parietal peritoneum, in contradistinction to the visceral peritoneum overlying and enveloping the abdominal organs, is supplied by the somatic intercostal and lumbar sensory nerves of the abdominal wall. Because of the suction produced by suddenly releasing the hand, the whole abdominal wall jumps away from the underlying abdominal contents with which it is normally in contact, and the sign is therefore similar to a pressure from inside outward by the examiner.

The presence of abdominal muscle rigidity is likewise an indication of involvement of the underlying somatic (in contradistinction to visceral) sensory nerves of the abdominal wall, with its reflex motor stimulation to the muscles innervated by these nerves. Its degree depends upon the extent and severity of irritation of the parietal peritoneal lining of the abdominal wall, and its location, the location of such involvement. Its presence offers no idea as to the causative organ producing the irritation, but its location might give a clue as to the probable organ involved in that particular location. It is elicited by gentle, slow, steady pressure on the abdomen with the fingers and hand laid flat on the abdominal wall. The presence of slight degrees of localized rigidity is determined by using equal pressure on the abdomen with both hands at different points, and determining which hand sinks more deeply into the abdominal wall. The less the rigidity, the more readily and the deeper will one or the other hand penetrate.

Skin hyperesthesia is elicited by picking up a portion of the skin and subcutaneous fat between the examiner's thumb and forefinger and twisting and pulling it away from the abdominal wall gently. This pinch is carried out over several uninvolved areas of the ab-

domen to the point of causing some discomfort to the patient. It is then repeated over all involved areas until points are noted where these pinches produce the greatest amount of discomfort or produce discomfort with the minimal amount of traction. Areas of such skin hyperesthesia are then mapped out readily and rapidly, and the point of maximal hyperesthesia is determined. These areas, and particularly the points of maximal skin hypersensitivity, are of extreme importance in differentiating related abdominal conditions, and localizing the diagnosis to a particular organ. For different organs give specific points of maximal skin hyperesthesia, when these organs are involved in an inflammatory or obstructive process.

Ruptured Ectopic Pregnancy

Of all the acute abdominal conditions in which a carefully taken history is of prime importance in arriving at a correct diagnosis, ruptured ectopic pregnancy is most illustrative of this point. Not only will the history make one strongly suspicious of it, but on carefully determining the exact location of the initial acute pain (and the patient could localize it with one finger and remember it well) one could determine the side of the perforation. In an extensive perforation with free fluid in the peritoneal cavity, the patient will always complain of pain in one or both shoulders on lying down, because of the irritation of the under surface of the diaphragm by the blood.[10] And in slow perforations, or in walling off of larger perforations by clotting, the patient will commonly complain of pain at the end of urination. This is but another way of demonstrating the presence of rebound tenderness due to irritation of the parietal pelvic peritoneum by the blood. For, as the bladder is emptied, the overlying stretched parietal peritoneum collapses and falls on the collapsed organ, giving rise to pain over the bladder or ill-localized pain in the pelvis.

One of the most oft described, yet clinically incorrect, signs for blood in the peritoneal cavity from any cause, is abdominal muscular rigidity. The author has yet to see a case of ruptured ectopic pregnancy with the peritoneal cavity filled with blood and blood clots that showed the slightest degree of localized or diffuse muscle rigidity. The peritoneal cavity apparently tolerates blood and blood proteins well, without exhibiting signs of marked irritation and consequent muscle rigidity. So much is this true that this route, i.e. intraperitoneal injection, has been used for saline and blood transfusion where other methods were not available. These patients do exhibit however a degree of exquisite rebound tenderness throughout the peritoneal cavity, if there is a massive spill, or over the point of perforation if localized, such as no other condition will manifest. This

rebound tenderness is manifested also by the presence of exquisite tenderness on motion of the cervix, which has been described as being as exquisitely tender as a fracture. For here also, the sudden displacement of the parietal pelvic peritoneum by motion of the cervix is another way of eliciting rebound tenderness. Likewise, with the finger inserted into the rectum, and pressing it anteriorly or from side to side, a great deal of pain is experienced by the patient, because of the temporary, sudden, though slight displacement of the parietal pelvic peritoneum. With the finger in the rectum or in the posterior fornix of the vagina, one could feel a diffuse fulness or bogginess due to the accumulated blood, but no definitely outlined mass, such as one could outline with a walled off pelvic abscess or tubo-ovarian abscess.

In spite of the absence of abdominal rigidity, these patients exhibit a rapidly increasing though moderate distension. But, contrary to the findings in most distended abdomens, there is a flatness to percussion over the abdomen, which is evident throughout the abdomen in massive hemorrhage, or over the lower abdomen in less severe hemorrhages. Percussion of the abdomen is an often too infrequently elicited sign, which is easy to perform and will give valuable information to the inquiring examiner. The flatness in these cases is produced by the blood overlying the gaseous distended loops of intestines.

In the spilling of blood into the peritoneal cavity, no matter how small or large the quantity, a rapidly rising leukocyte count occurs over the first twelve hours following the spill, no matter what the cause.[21] Although acute massive hemorrhage will produce a moderate, though non-varying leukocytosis, with hemorrhage into the peritoneal cavity, this progressively rises to a maximum of 20,000 to 40,000 white blood cells at the end of 12 hours, and then slowly falls in the next 24 hours. This is a most significant sign in the early case, and will most certainly differentiate the slow bleeding, less dramatic types of ruptured ectopic pregnancy with small intraperitoneal spills of blood, from other confusing conditions such as acute salpingitis, appendicitis, etc. Likewise the sedimentation rate will be increased, though never to the extent seen in acute salpingitis or tubo-ovarian abscess. For, instead of being over two hours, as is observed in normal individuals, the rate will be accelerated to 50 or 60 minutes. At no time, will the rapid rates of 5 to 15 minutes, as seen in acute salpingitis, be observed. The one rare exception to this, is the extremely rare case of infected ectopic pregnancy, when the sedimentation rate may be further accelerated.

In the less severe types of ruptured ectopic pregnancy, with intraperitoneal bleeding permitted to occur over a period of time, clinical

or subclinical jaundice may manifest itself, even as early as 24 hours after onset.[3] This is due to the absorption of the destroyed red blood cells from the peritoneal cavity. This sign is frequently of great aid in the obscure, less dramatic type of ectopic rupture.[17]

Acute Appendicitis

One of the most commonly elicited signs in the diagnosis of acute appendicitis is tenderness to pressure over the right lower quadrant of the abdomen. So many clinical conditions may give similar areas of tenderness that it is imperative always to elicit the exact point of maximal tenderness. No matter where the appendix is anatomically located, this point of maximal tenderness, elicited by gentle pressure with one finger over several points in the right lower quadrant, will be located at McBurney's point. This point is located at 1½-2 inches upward on a line joining the anterior superior spine of the ilium with the umbilicus, and does not vary with the size or configuration of the abdomen. Another point of marked tenderness, frequently elicited before gangrene or perforation supervenes, is in the exact mid-epigastrium, about two inches below the ensiform cartilage in the midline. Frequently on pressure at this point, the patient will complain of increased nausea.

Another important sign is the presence of skin hyperesthesia in a triangular area of the right lower quadrant of the abdomen, bounded by a line from the umbilicus to the highest point of the iliac crest as the upper limb of the triangle; a line from the pubic spine to the highest point of the iliac crest as the lower limb; and one joining the umbilicus to the pubic spine as the third side of the triangle.[13] The point of maximal skin hyperesthesia is in the center of this triangle, or approximately at McBurney's point. This is invariably present with an inflammatory appendicitis or with appendiceal obstruction with colic, and is specific for this organ, no matter what its location. Should gangrene or perforation supervene, this sign of skin hyperesthesia, which is dependent upon increased intraluminary tension with stretching of the wall of the appendix, disappears.

With the onset of involvement of the visceral peritoneum covering the appendix with a circulatory or inflammatory process, and thence involvement of the parietal peritoneum, several other signs make their appearance. One of these is abdominal muscular rigidity. This is frequently slight at the onset, and could be elicited only by making gentle comparative pressure on the muscles of the left side of the abdomen, followed by similar pressure on the right side. In infants and the aged, this sign is frequently absent, leading often to mistaken diagnoses and delay in operation.[1,15] With the appendix

lying retrocecal or pointing medially, with involvement of the posterior parietal peritoneum in the inflammatory process, tenderness may be elicited in the back over the quadratus lumborum muscle, and spasm of the iliopsoas muscle may be noted. This manifests itself when an attempt is made to hyperextend the right thigh. If the appendix overlies the brim of the pelvis, spasm of the obturator muscle may occur, causing pain on internal rotation of the right thigh. Likewise with involvement of the parietal peritoneum, exquisite rebound tenderness could be elicited in the right lower quadrant. If further involvement of the parietal peritoneum occurs, this area of rebound tenderness may spread to the left side as well as upward to the right upper quadrant. Rebound tenderness may however be entirely absent in appendices that are completely retrocecal, and clothed on all sides by the cecum, or in low pelvic appendices where the pelvic parietal peritoneum is involved, and not that of the anterior abdominal wall. Here, right sided rectal tenderness is marked. Such rectal tenderness, which is another method of eliciting rebound tenderness, is found in 80 to 90 per cent of all cases of acute appendicitis, no matter what its location, when properly examined for[22]. In the male, because of adherence of the prostate to the anterior rectal wall over a considerable area, the finger has to be inserted above the upper edge of the prostate to reach the rectovesical pouch of peritoneum. In the female, the finger has to be inserted high, above the level of the upper border of the cervix, to reach the rectouterine reflection of peritoneum. Comparison is then made of the pain elicited by pressure on the left side of the pouch, with that produced by pressure on the right. This sign is of extreme importance in the infant, whose reactions and outbursts of crying could be gauged following pressure on one side of the rectum, then the other.

The presence of chills and fever is very frequently taken as an indication that the diagnosis is not that of acute appendicitis. And yet, when gangrene of the appendix supervenes, or when thrombophlebitis of the vein of the mesentery of the appendix occurs, chills and fever are of frequent occurrence.[7] Occasionally, in the rapidly progressive case of acute appendicitis, chills and fever may be present early, without the onset of gangrene. Another confusing sign is the presence of pus cells in the urine, leading to a mistaken diagnosis of right sided pyelitis. This sign is however not uncommonly present (in 10 per cent of cases), particularly when the appendix points medially and overlies the right ureter, producing a peri-ureteritis. With this, a few red blood cells may also be present in the urine. Of extreme importance in aiding the diagnosis of acute appendicitis and differentiating it from pelvic inflammatory disease

in the female, is the sedimentation rate. In all cases of acute appendicitis, with or without gangrene or perforation, the sedimentation rate is invariably normal. This sign has been frequently neglected, and its importance has only been recently emphasized in large series of cases.[11]

Acute Cholecystitis

In acute cholecystitis tenderness is found in the mid-epigastrium and right upper quadrant of the abdomen, and the point of maximal tenderness is located at the tip of the ninth rib, at the junction of the outer border of the rectus abdominus muscle with the costal cage. At no time does the uncomplicated case of acute cholecystitis have points of tenderness to the left of the midline. Associated with this, there is spasm of the right upper abdominal muscles, and skin hyperesthesia in the right upper quadrant. The area of skin hyperesthesia is usually delimited by a triangle—one side of which extends from the ensiform to the eighth rib in the mid-axillary line; another from the tip of the ensiform to the umbilicus; and a third joining the ends of the first two.[14] At no time does the area of skin sensitivity extend to the left of this area. The point of maximal skin hyperesthesia is approximately at the center of this triangle, or at the tip of the ninth rib at the outer border of the rectus muscle. This area of skin hyperalgesia disappears when the gallbladder becomes gangrenous or perforates. On consecutive pressure over the tips of the spinous processes of the thoracic vertebrae, tenderness is elicited on pressure over the tip of the ninth thoracic vertebra to the exclusion of all the others. This is an additional confirmatory sign that helps to differentiate a case of acute cholecystitis from one of coronary occlusion. In the latter lesion, tenderness is invariably found over the tips of the seventh cervical and first and second thoracic spinous processes. In acute cholecystitis, where the infection has spread to the under surface of the right diaphragm, the patient may complain of pain in the right shoulder. Very rarely is pain in the left shoulder found in gallbladder disease, but it not uncommonly radiates here in occlusion of the coronary artery.

Perforated Peptic Ulcer

One of the most common misconceptions concerning the diagnosis of perforated peptic ulcer is that such patients are in a state of shock immediately after their perforation. The clinical picture of shock, with cyanosis, cold, clammy skin, thready pulse, fall in blood pressure, is extremely rare in perforated peptic ulcer.[6,20] At the onset these patients are seen with a full bounding pulse but complaining bitterly of severe constant epigastric pains. A period of re-

action and improvement may then supervene with subsidence of the pain, which may lull the doctor into feeling that his original diagnosis was incorrect. Such a period, lasting from one to two hours, then gives way to the recurrence of the epigastric pains with radiation of the pain to the entire abdomen and shoulders. With the onset of the original pain the patient may vomit, particularly in perforated duodenal ulcer. Rarely does the vomiting occur more than once, however.[16]

On examination of the patient with perforated gastric ulcer, he will be found to have diffuse abdominal tenderness, with the point of maximal tenderness in the mid-epigastrium, with hyperalgesia of the skin in this area. The abdomen, even during the period of reactive calm in which the patient "feels fine," will show marked board-like rigidity, with exquisite rebound tenderness throughout. Such rebound tenderness will be evidenced in the pelvic peritoneum too, by marked tenderness on rectal examination. Due to the accumulation of gas between the liver and diaphragm, having escaped through the stomach perforation, the normal liver dulness will be obliterated.[16] This tympany will be most evident in the mid-axillary region, below the fourth rib.

Should the perforation occur on the duodenal side, the duodenal contents escape downward over the ascending colon and into the right colic gutter, instead of into the general peritoneal cavity. The signs produced are therefore not as marked or widespread. Here, the tenderness is present over the right side of the abdomen, with the point of maximal tenderness about two inches to the right of the mid-epigastrium. The muscle rigidity is entirely confined to the right rectus muscle, and is board-like in character. Because of the spread of the irritating duodenal contents to the cecum and appendiceal area, the signs of a peri-appendicitis soon become evident, often confusing the diagnosis.[2,16] It is not at all unusual for a perforated duodenal ulcer to be operated upon for acute appendicitis, with the error in diagnosis discovered at the time of operation. Frequently because of the probable irritation of the head of the pancreas by the duodenal spillage, small quantities of sugar will be found in the urine immediately after perforation. Although commonly giving pain referred to the right shoulder, because of the irritation of the under surface of the diaphragm by the fluid, there is less escape of gas under the diaphragm than in perforated gastric ulcer, because of spasm of the pylorus. As a consequence, obliteration of liver dulness is not as commonly seen following duodenal ulcer perforation, as following perforation of a gastric ulcer, where the swallowed air has ready escape to the peritoneal cavity.

In the rare instances of posterior perforation of a gastric ulcer, the clinical picture is not as marked or widespread, for the fluid accumulates in the lesser peritoneal cavity. Here, the patient complains of severe pain in the back and left shoulder, and lacks the marked rigidity and tenderness over the anterior abdominal wall. In these cases, tenderness is most marked over the back, on its left side, with the point of maximal tenderness somewhat anterior to the tip of the left eleventh rib. Such a patient may go on to subphrenic abscess formation without the original diagnosis having been established.

Acute Pancreatitis

As there are many grades of involvement of the gallbladder in acute cholecystitis, so are there several degrees of pancreatitis associated with acute gallbladder disease—from acute edematous pancreatitis to severe hemorrhagic pancreatitis with necrosis. The full-blown, severe, acute case of hemorrhagic pancreatitis with free fluid in the peritoneal cavity and fat necrosis, will manifest itself with sudden, severe epigastric pain, coming on immediately after a heavy meal or an alcoholic debauch, and followed by frequent attacks of nausea and vomiting. The patient will be restless and toss about in bed and complain bitterly of pain in the back, made worse by lying on his back. On examination, the severe case of acute pancreatitis will exhibit a peculiar dusky cyanosis about the face and hands, and signs of moderate to severe shock. The abdomen will rapidly become distended, but at no time, unless the process is allowed to go on to suppuration, will there be any noticeable rigidity of the abdominal muscles. The one exception to this, would be the patient presenting evidence of a coexisting, marked, acute cholecystitis, in which case the muscles of the right upper quadrant would show some rigidity. The patient will present some tenderness and marked rebound tenderness throughout the abdomen, with several points of maximal tenderness. One of these will be in the exact mid-epigastrium, and another about one inch above and one inch to the right or left of the umbilicus. Immediately in front of tip of the left eleventh rib, the patient will also present a point of marked tenderness on pressure inward with one finger. On pressure over the consecutive spinous processes of the thoracic vertebrae, the tip of the tenth thoracic spine will be most tender. Of the laboratory aids of most value, there are two which are present within the first 24 to 48 hours of the acute onset. Following that, their absence does not rule out the diagnosis of acute pancreatitis. One of these, is the presence of small amounts of sugar and albumin in the urine, and the other is a marked though temporary increase in the blood diastase to values sometimes 5 to 10 times the normal. This how-

ever, rapidly returns to normal or slightly elevated values, after the first 24 to 48 hours.

Acute Sigmoid Diverticulitis

Patients presenting signs of an acute perforation or inflammation of a diverticulum of the sigmoid, are usually middle-aged, and stout individuals, with thick abdominal walls. Such patients have a history of marked constipation, with recent increased difficulty in moving their bowels. As a rule, there will be no nausea or vomiting. Their inflammatory signs will be rapidly progressive, and when presenting themselves for examination, they will be acutely ill looking. As a rule, these signs and symptoms are more rapidly progressive than those of acute appendicitis. Tenderness and rebound tenderness will be present throughout the whole lower abdomen, but will be most marked in the left lower quadrant, where, even promptly after the onset of symptoms, an induration or mass will be palpable. Rigidity will be localized to the left lower quadrant of the abdomen, but distention will be rapidly progressive and diffuse. Should abscess formation occur, the signs will become more localized to the location of the inflammatory mass.

Acute Intestinal Obstruction

There are four cardinal symptoms of intestinal obstruction, though each one is not necessarily present in every case. The patient with intestinal obstruction will always complain of acute, severe colicky pains, of sudden onset and located in the midline of the umbilical region in small bowel obstruction, and in the midline of the hypogastric region in large bowel obstruction. With this there will be regurgitant vomiting particularly in small bowel obstruction (usually entirely absent in obstructions of the large bowel), absolute constipation (absent in partial or high intestinal obstruction in which some material may be passed beyond the point of obstruction, or intestinal secretions may be produced distal to it), and steadily increasing distention of the abdomen (may be entirely absent in duodenal or high jejunal obstruction). Without the complications of gangrene or perforation, there will be a complete absence of any rigidity of the abdominal muscles or points of marked tenderness in the abdomen. In small intestinal obstruction, fluid will accumulate in the obstructed loops and will give a localized flatness to percussion, instead of the tympany usually found over other distended loops of bowel.

With the onset of gangrene, a hemorrhagic irritating fluid accumulates in the peritoneal cavity giving rise to other signs. Instead of the temperature and pulse remaining normal as occurs in the

uncomplicated case of intestinal obstruction, there is a progressive rise in both. The abdomen, though still showing no signs of abdominal rigidity, will show marked rebound tenderness throughout. These signs are worth remembering in the patients who may seem to be improving temporarily with the passage of a Miller-Abbott tube into the obstructed loops of bowel with the removal of accumulated gases and fluids, but who go on to develop gangrene of the obstructed loop. Often, because of the temporary improvement of the patient, the onset of gangrene is not looked for until such time as the patient develops diffuse peritonitis and is beyond the stage of being helped by surgery. With the onset of perforation, diffuse abdominal rigidity occurs, together with the other signs of diffuse peritonitis.

Very frequently, a great deal of unnecessary difficulty will be encountered by the physician in diagnosing the etiology of a particular case of intestinal obstruction, before operation. This problem becomes relatively easy when it is remembered that four etiologic factors are responsible for 85 per cent of all cases of intestinal obstruction.[12] Fifty per cent of all cases, at all ages, are due to external hernias. A simple examination of all the hernial rings will disclose an exquisitely tender, perhaps reddened hernial protrusion in every other case of intestinal obstruction. In the very young (75 per cent occur before the age of 2), the next most common cause is intussusception. In the middle-aged or aged individual, carcinoma of the large bowel (75 per cent occur in the sigmoid, rectosigmoid or rectum) accounts for the second most frequent cause of intestinal obstruction. In all age groups, postoperative or post-inflammatory adhesions are the next most common causes. All other etiologic factors, and there are scores of them, account for but 15 per cent of all cases of intestinal obstruction. Knowing these etiologic factors, one could locate the site of the obstruction in the great majority of cases with comparative ease.

Renal and Ureteral Colic

Of all the clinical conditions which offer difficulty in being differentiated from acute surgical lesions of the abdomen, acute renal or ureteral colic due to stone or infection, seem to offer the greatest difficulty. Yet this should not be so, considering the typical history and physical findings these patients present. With radiation of the pain to the groin or testicle, as commonly occurs, the testicle on that side becomes retracted because of the spasm of the cremasteric muscle. Likewise, the testicle is very painful to traction, compared with its mate on the opposite side. There is a rigidity of the quadratus lumborum muscle on the same side, with a finger point of

marked tenderness at the junction of the outer end of the quadratus lumborum muscle with the lower border of the tenth rib. There is some tenderness to pressure over the spinous processes of the first and second lumbar vertebrae, not present over any of the other vertebrae. Most important is a triangular area of skin hyperalgesia, tender to pinch or pin prick, on the inner side of the thigh on the side of the lesion.[14] This triangle is formed by the inner half of Poupart's ligament; by a line running parallel with the inner border of the sartorius muscle from the midpoint of Poupart's ligament to the inner side of the thigh; and another line extending downward from the pubic tubercle, on the inner side of the thigh, joining the first two. This area of skin hyperesthesia occurs in but one other condition and that is acute rupture or torsion of an ovarian cyst. The point of maximal hyperalgesia is located in the middle of this triangle.

Acute Mesenteric Adenitis

A self-limited clinical entity occurs in children particularly, that is often extremely difficult to differentiate from acute appendicitis, and leads to unnecessary surgical intervention, i.e., acute mesenteric adenitis.[19] It frequently follows an acute upper respiratory infection, progresses rapidly with temperature and frequently vomiting, at the onset.[18] On examination, such children will present a diffusely tender abdomen, with rebound tenderness, with little or no rigidity, and with no particular point of maximal tenderness. The white blood count will be elevated at the onset—much higher than would be expected with an acute appendicitis of the same duration. At operation, a moderate amount of free pink-yellow fluid will be found in the peritoneal cavity, and an enlargement of all the mesenteric lymph nodes. These patients usually undergo a rapid and complete recovery, following appendectomy. Some authors recommend appendectomy as the treatment of choice in these cases.

Primary Peritonitis in Children

In infants, particularly below the age of 4 years, a primary pneumococcic or streptococcic peritonitis occurs, which leads to very marked signs and symptoms. In the majority of these patients, there is a history of a preceding upper respiratory infection. These children are acutely ill from the onset, with high temperature, nausea and vomiting, and diffuse distention of the abdomen.[9] Usually a history of diarrhea is obtained at the onset of the illness. There is a lack of any marked rigidity of the abdominal muscles in those under two years of age, but there is a diffuse tenderness and rebound tenderness throughout the abdomen. The white blood count is

frequently very high, averaging 20,000 to 50,000 white blood cells per cubic millimeter blood.

Acute Salpingitis

One of the most commonly made errors in abdominal diagnosis is that of not correctly differentiating acute salpingitis from acute appendicitis. Yet the signs each one presents are fairly distinct and clear cut. Occasionally, particularly with the first attack of acute salpingitis, such patients may have acute localized pains in the right upper quadrant of the abdomen, confusing the diagnosis with that of acute cholecystitis.[4]

The typical case of acute salpingitis will have tenderness in both lower quadrants of the abdomen, with the point of maximal tenderness one-fourth the distance upward on a line joining the umbilicus with the midpoint of Poupart's ligament.[12] Such finger point, maximal tenderness is specific for tubal or ovarian involvement. Occasionally skin hyperesthesia will be found in this area, or at a point one inch downward on a line joining the umbilicus with the anterior superior spine of the ilium, particularly with obstruction to the outflow of secretions from the tube.[8] But this sign is frequently absent. The temperature in these patients at the onset, though not very high, is usually higher than in patients with acute appendicitis. This is similarly true of the leukocytosis. The one most pathognomonic differential diagnostic laboratory test is the sedimentation rate. No matter how minimal or extensive the acute salpingitis, the sedimentation rate will always be markedly accelerated. This is in sharp contrast to the normal rate found in cases of acute appendicitis.[11]

Ruptured Graafian Follicle

Another condition in the young female, often leading to mistaken diagnosis is rupture of a graafian follicle with its incident acute abdominal signs and symptoms. Such attacks come on exactly midway between the menstrual periods, and lead to sudden, severe, lancinating pains in one or the other lower quadrant of the abdomen.[5] Often the pain will radiate down the inner side of the thigh and lead to spasm of the thigh muscles with pain on hyperextension or walking. Frequently, the patient will become faint, nauseated and vomit at the onset.

On examination within the first few hours of the onset, the temperature will be slightly elevated, and the pulse will be out of proportion to the temperature. The abdomen will show no rigidity, but will present marked tenderness to deep pressure over the side of perforation, with rebound tenderness, in the lower abdomen.

The point of maximal tenderness will be similar to that seen in acute salpingitis, i.e., one-fourth the distance upward on a line from the midpoint of Poupart's ligament to the umbilicus. Interestingly enough, these patients commonly present an area of skin hyperesthesia similar to that seen in kidney affections on the inner side of the thigh.

Torsion Ovarian Pedicle

Although the acute onset and location of the pain in torsion of the pedicle of an ovarian cyst is similar to that seen in ruptured graafian follicle, the colicky pains are not as short lasting as occur in the latter condition, but remain severe and persistent. The temperature and pulse remain normal at the onset, but become altered later with the alteration in the circulation of the pedicle and gangrene formation. Tenderness and moderate rigidity are present at the onset with the point of maximal tenderness one-fourth the way upward on a line from the midpoint of Poupart's ligament to the umbilicus. Skin hyperalgesia is present on the inner side of the thigh. With the onset of circulatory and gangrene changes, marked rebound tenderness appears as a prominent sign.

Torsion of the Testicle

Although outside the abdominal cavity, acute affections of the testicle, cord or epidydimis are capable of producing profound signs and symptoms similar to that seen in acute abdominal affections. In torsion of the testicle, the patient may experience severe, acute, colicky lower abdominal pains, and present signs of marked tenderness and rebound tenderness in one or the other lower quadrants of the abdomen. The most important differential diagnostic sign that these patients present however, is a very marked tenderness, edema and swelling along the entire cord and testicle. They may also present a marked hyperalgesia of the skin of the inner side of the thigh, with spasm of the muscles of the affected thigh.

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REFERENCES

1. Boye, F. F.: Acute Appendicitis in Middle and Late Life; Analysis of 421 Cases in Individuals over 29 Years of Age, Am. J. Digest. Dis. *8:* 223-230 (June) 1941.
2. DeBakey, M.: Acute Gastroduodenal Ulceration; Statistical Analysis and Review of Literature, Surgery *8:* 852-884 (Nov.) 1940.
3. Dumphy, J. J., and Fallon, J.: Diagnosis of Extra-Uterine Pregnancy—With Note on Significance of Jaundice and Hyperbilirubinemia, New England J. Med. *205:* 540, 1931.
4. Fitz-Hugh, T.: Acute Gonococcic Perihepatitis—A New Syndrome of Right Upper Quadrant Abdominal Pain in Young Women, Rev. Gastroenterol. *3:* 125, 1936.
5. Guy, C. C., and Rotondi, A. J.: Ovarian Lesions Simulating Appendicitis, Surg., Gynec. & Obst. *70:* 1100-1104 (June) 1940.

6. Griswold, R. A., and Antoncic, R. F.: Perforated Peptic Ulcer, Ann. Surg. *113:* 791-801 (May) 1941.
7. Hawkes, S. Z.: Thrombophlebitis of the Appendiceal Vein Complicating Acute Appendicitis, Surg., Gynec. & Obst. *66:* 62-78 (Jan.) 1938.
8. Labate, J. S.: Skin Hyperesthesia in Acute Salpingitis, Surg., Gynec. & Obst. *65:* 321-330 (Sept.) 1937.
9. Ladd, W. E.: Primary Peritonitis in Infants and Children, J. A. M. A. *113:* 1455 (Oct. 14) 1939.
10. Laffont, A.: La douleur tardive elevee dans la grossesse extrauterine—Un nouveau signe de rupture tubaire, Presse med. *32:* 167, 1924.
11. Lesser, A., and Kaufman, L. R.: A Five Year Survey of Blood Sedimentation Test in Acute Appendicitis, Surg., Gynec. & Obst. *73:* 163-164 (Aug.) 1941.
12. Livingston, E. M.: A Clinical Study of the Abdominal Cavity and Peritoneum, New York, Paul B. Hoeber, Inc., 1932.
13. Livingston, E. M.: The Skin Triangle of Appendicitis, Arch. Surg. *13:* 630, 1926.
14. Livingston, E. M.: Further Studies of Viscerosensory Phenomena—Acute Cholecystitis; Acute Nephrolithiasis, J. A. M. A. *82:* 1495, 1924.
15. Maes, U.: Acute Appendicitis at the Extremes of Life, South. Surgeon *4:* 422, 1935.
16. Martz, H., and Foote, M. N.: Analysis of 50 Cases of Perforated Peptic Ulcer, Am. J. Surg. *48:* 634-640 (June) 1940.
17. Martz, H.: Repeated Ectopic Pregnancy Simulating Intestinal Obstruction, Am. J. Surg. *40:* 479-484 (May) 1938.
18. Rosenburg, S.: Non-Specific Mesenteric Lymphadenitis, Arch. Surg. *35:* 1031-1044 (Dec.) 1937.
19. Sobel, I. P., and Stettin, DeW.: Nonspecific Mesenteric Lymphadenitis; Report of 58 Cases, J. Pediat. *17:* 305-314 (Sept.) 1940.
20. Soutter, L.: Shock in Perforated Peptic Ulcer, Surgery *10:* 233-241 (Aug.) 1941.
21. Wright, A. M., and Livingston, E. M.: The Leucocytosis of Internal Hemorrhage, New York State J. Med. *23:* 286-291 (July) 1923.
22. Martz, H., and Foote, M. N.: Drainage and Delayed Operation in Acute Appendicitis, J. M. A. Alabama *10:* 189-195 (Dec.) 1940.

GOITER IN CENTRAL KENTUCKY

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CENTRAL Kentucky is ordinarily not considered in the endemic goiter region. A great part of the country is covered with phosphatic limestone and due to its disintegration the iodine content of the soil is high. Samples of the soil taken in five different areas of the state show the "Blue Grass" or central area to contain 4.69 parts of iodine per million as contrasted to 2.05 parts per million in the eastern mountainous area. It is from this mountainous area our toxic and colloid goiters come. The water supply of Lexington is extraordinarily high in iodine. An average of many analyses shows 14 parts of iodine per billion as contrasted to 0.86 per billion in Lake Erie at Cleveland, 0.12 parts in Lake Michigan at Chicago, 0.21 in the Scioto River at Columbus, Ohio, and 0.60 in the James River at Richmond. In spite of this we feel that there is a relatively high incidence of thyroid disease in this area.

This is a ten year survey of patients operated on for thyroid disease in the two general hospitals of Lexington, Kentucky. These patients have been grouped according to the diagnoses suggested by the American Association for the Study of Goiter. There were 99,314 admissions to the two hospitals, 24 per cent being surgical. There were 1153 goiter admissions or 4.5 per cent of the general surgical group. This ten year period of 1153 cases of thyroid disease does not include patients with hypothyroidism or those admitted for basal metabolic rates. There were fifty-five patients who were not operated on and seventeen were admitted for recurrence of thyroid disease. Their first operation was done in Lexington in some cases and elsewhere in others.

I may say at this point the diagnosis is often difficult to determine from some charts and I have considered the history, clinical course, pathologic report, and reaction of the patient to operation in separating these patients into four main groups. (The terms hyperplastic goiter, nodular goiter, hyperthyroidism, exophthalmic goiter, fetal adenoma, adenomatous goiter, toxic thyroid, etc., are misleading, and I have taken the liberty of changing the diagnosis in some cases when the evidence seemed to warrant it.) The study has shown a crying need for the profession to adopt a uniform diagnosis for thyroid disease. No classification is better than that of the American Association for the Study of Goiter, although we agree that it is far from ideal. This classification is based on the

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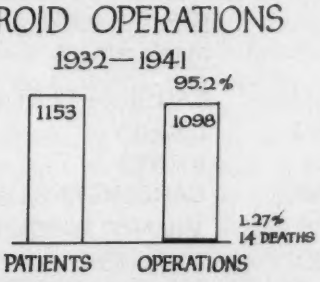
gross anatomy and gross clinical picture and under one of these four main classifications any of the types of glands seen may be placed. No classification based on the microscopic picture of the tissue is of much value.

Following is the classification as suggested by the American Association for the Study of Goiter:

1. Toxic Diffuse Goiter
2. Non-toxic Diffuse Goiter
3. Toxic Nodular Goiter
   (a) Malignant Tumors
   (b) Thyroiditis
   (c) Tuberculosis
4. Non-toxic Nodular Goiter

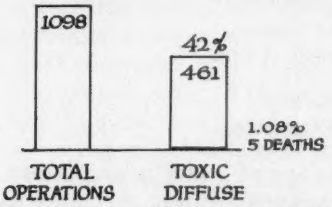
"Until the etiology of goiter is established it can best be defined as a disease of unknown cause, the most common characteristics of which are disturbed function and enlargement of the thyroid gland." Enlargement of the gland is usually present but not necessarily so. This classification completely ignores the pathologic classifications and is to be thought of as a clinical grouping, well realizing that histopathologic examination is necessary.



In our 1098 cases of thyroid disease operated on there were 461 patients who were placed in the first group of toxic diffuse goiter. This is the group which is often referred to as exophthalmic goiter, Graves' disease, or hyperthyroidism. In these 461 cases there were five deaths. Two patients died of thyroid crisis within twenty-four hours following operation. Both these cases were in 1937 and there have been no crisis deaths since. Both were operated on after what was thought to be a sufficient period of preparation. Both had had ten days of Lugol's, bed rest, etc., but immediately following operation went into what we call thyroid crisis or storm, hyperpyrexia, a pulse so fast as to be uncountable, restlessness to the point of mania, and death. The presence of jaundice or the signs of liver insufficiency unfortunately escaped our observation five years ago.

We think these deaths would not have occurred today. One patient in this group died of generalized miliary tuberculosis thirty days postoperative. Her thyroidectomy had been done hoping to reduce her metabolism and thus improve the tuberculosis. There was one cardiac failure forty-eight hours after operation and one tracheal

TOXIC DIFFUSE GOITER
1932 — 1941



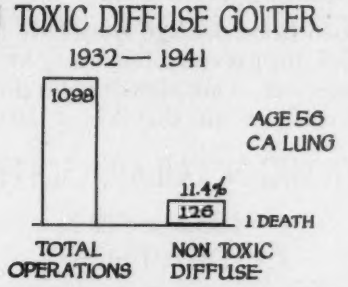
collapse five hours after surgery. Five deaths in this group of 461 patients gives a mortality rate of 1.08 per cent which compares quite favorably to the rate in the private practice of many clinics. Most of these operations were done by seven surgeons on the

TOXIC DIFFUSE GOITER
1932 — 1941
DEATHS

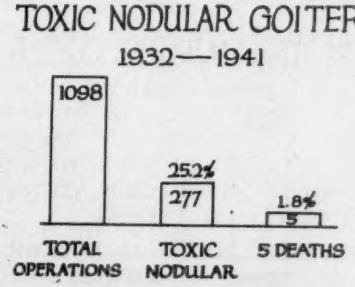
AGE	CAUSE of DEATH
60	CRISIS
21	CRISIS
49	CARDIAC FAILURE
24	MILIARY TUBERCULOSIS
39	TRACHEAL COLLAPSE

staffs of the two hospitals. Standardized preoperative and postoperative treatment is impossible under this set-up. Practically all patients received the following: Lugol's or sodium iodide 15 drops three times a day, phenobarbital grain ½ three times a day, bed rest with toilet privileges in some cases, high caloric and high vitamin diet including protein, forced fluids, and in the past eighteen months the severely toxic patients have received glucose intravenously. Postoperatively the very toxic patient receives glucose intravenously, iodine and morphine to tolerance. We feel that morphine is the best drug for postoperative pain, restlessness, and nervousness. It controls the operative reaction. Other medication is notably absent from the records. Quinidine, digitalis and similar drugs have been used very rarely.

About 60 per cent of the anesthetics have been local until the past eighteen months. In that time cyclopropane, nitrous oxide, and ethylene have been more widely used. Because of the higher oxygen concentration, cyclopropane is being used more frequently now than previously.



In the second group, which is the non-toxic diffuse goiter, often called colloid or adolescence goiter, there were 126 cases with one death. This patient had a non-toxic diffuse goiter but her basal metabolic rate was plus 32 to plus 40 per cent and the diagnosis of carcinoma of the lung was not made until after thyroidectomy was done. She died some forty-five days after operation of diffuse metastasis from the lung cancer. This death should not be credited to the thyroid operation but has been included in the statistical study. In this group were goiters removed because of pressure, for cosmetic reasons, and occasionally for the mistaken symptoms of hyperthyroidism. It is my impression that diffuse non-toxic goiter is not as common in Central Kentucky as in many other districts where the supply of iodine is not so plentiful. This is only an impression, however, as no survey of the school group has been made. Only by such a survey can we see whether thyroid disease is on the increase or decrease.



In the third group, toxic nodular goiter, we had five deaths in 277 cases. All of these patients who died were over 60. Two died

of pneumonia, one of hypertension, and two of accidents, one tracheal collapse, the other postoperative hemorrhage with pressure on the trachea and suffocation. Many of these patients had had goiters for years, large nodular masses, occasionally being substernal and often compressing the trachea and softening the rings. It is in this group that nursing care and close attention is most needed.

Long continued heart damage frequently is the cause of the increased mortality, the patients often being over 60 and past the age of best operative risk. Our highest mortality, 1.8 per cent, is in this group, but it is also true that it is in this group that more acci-

TOXIC NODULAR GOITER

1932—1941

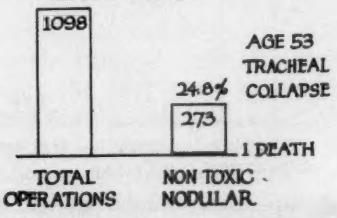
DEATHS

AGE	CAUSE of DEATH
74	PNEUMONIA
70	PNEUMONIA
65	HYPERTENSION
64	TRACHEAL COLLAPSE
60	HEMORRHAGE with SUFFOCATION

dents happen. Sudden release of an old hard nodular gland which has softened the rings of the trachea can invite disaster and the ligature on large dilated veins can be loosened by coughing with resultant hemorrhage. I remember only too well one of my own cases which bled, not beneath the skin where the nurse could recognize it but beneath the muscles with slow, steady but sure compression and strangulation. The rasping stridor of this type of respiratory obstruction should be the signal for immediate opening of the recent wound and liberation of the pressure on the trachea. Only in this way can the patient be saved.

NON TOXIC NODULAR GOITER

1932—1941

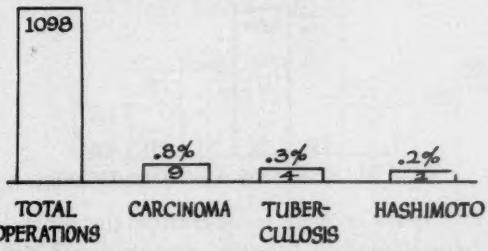


In the non-toxic nodular group there were 273 cases with but one

death; a large, hard nodular non-toxic goiter which had softened the trachea. In spite of a tracheotomy tube being beside the bed with orders to the house staff to do an immediate tracheotomy if necessary, the trachea collapsed six hours after the operation and the patient died. This group is liable to the same accidents as the previous group. Long standing tumors of the thyroid with release of the support cause this type of accident. Stage operations might prevent this to some extent.

GOITRE

1932 — 1941



There were nine cases of malignant tumors of the thyroid, two of these patients died while still in the hospital. This is a surprisingly low number of malignant tumors and does not follow the usual 2.5 to 3 per cent found in other groups. Several of these nine were small completely surrounded areas of malignant tissue and they have survived, while the patients who died were operated on for relief of obstruction and the operation made their deaths easier.

Four cases of tuberculosis, an incidence of 0.3 per cent, and three cases of Hashimoto's struma make the total. There were no cases of Reidel's struma in these 1100 cases.

GOITRE

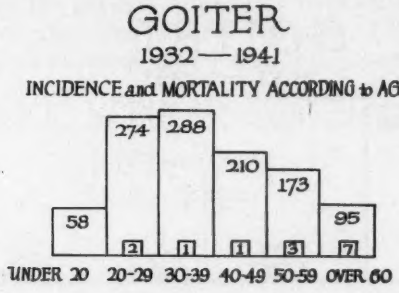
1932 — 1941

MORTALITY ACCORDING TO DIAGNOSIS

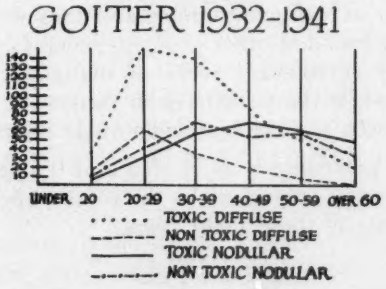
DIAGNOSIS	CASES	DEATHS	MORTALITY
TOXIC DIFFUSE	461	5	1.08%
NON TOXIC DIFFUSE	126	1	.8%
TOXIC NODULAR	277	5	1.8%
NON TOXIC NODULAR	273	1	.36%
CARCINOMA	9	2	22%
TUBERCULOSIS	4	0	0%
THYROIDITIS	3	0	0%
	1153	14	1.27%

Of these 14 deaths the carcinoma of the lung and miliary tuberculosis should not be considered as due to thyroidectomy.

There were three patients who died of suffocation due to tracheal collapse and one who died of suffocation due to hemorrhage. Poor nursing care rather than anything else was responsible for these deaths. In the past year I have insisted on a graduate nurse with each patient for the first eight hours after thyroidectomy. Prompt recognition of respiratory failure and close attention to the tracheotomy tube is necessary to prevent more of these suffocation deaths.

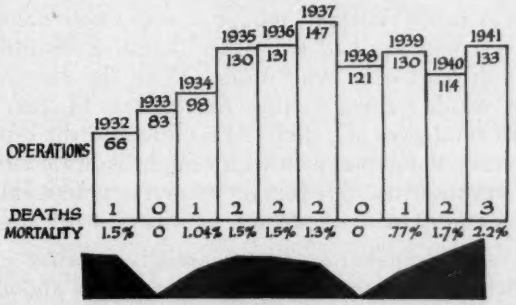


In our 1098 cases coming to operation the mortality was 1.27 per cent. The mortality of the toxic groups was 3 per cent and the mortality of the non-toxic .5 of 1 per cent.



Before 1932 ligations were done rather frequently in the bad risk patient but in the past ten years only twelve have been done and one surgeon has done all of them. I believe, as Bartlett does, that the mortality of ligations is higher than that for direct attack on the gland and that there is no emergency operative treatment for thyrotoxicosis. I believe that stage operations are definitely indicated in the massive nodular types and in the severely toxic in dividuals. I have often noted that a much more severe reaction follows the first lobectomy than the second. This is likely due to the increased activity in the remaining lobe after the first partial operation and unless the risk seems to be too great we try to complete the operation in one stage.

In beginning this study I had hoped to find that our mortality curve would show a consistent drop with our increasing knowledge of the role of the liver in hyperthyroidism and with more experienced operators doing the major number of cases. Unfortunately this is not the case as our mortality in 1940 and 1941 is the highest in the ten year period. In the five deaths in the last two years factors other than the thyroid accounted for two deaths and postoperative accidents accounted for two more. I feel that our preparation of patients for operation is satisfactory, our operative



mortality as low as a group of surgeons working independently can expect, but our postoperative care poor. To reduce mortality we must prevent accidents following the operation. To prevent accidents we must have better nursing care. This nursing care is our own responsibility which cannot be placed on the training school of the hospital. If patients die, it is our fault. We cannot shift the blame to the nursing staff. Nurses can be taught to appreciate the early signs of serious trouble and we must hold ourselves and our house staffs in readiness to respond instantly when accidents do occur.

REFERENCES

1. Bartlett, W., Jr. Abandonment of Ligations Preliminary to Thyroidectomy. South. M. J. *33:* 229-234 (March) 1940.
2. Van Meter, S. D.; Shivers, M. O., and Simpson, Walter P.: Report of the Committee on Classification of the American Association for the Study of Goiter. Western Journal of Surgery *39:* 947-948 (Dec.) 1931.
3. Boyce, F. F., and McFetridge, E. M.: Studies of Hepatic Function by the Quick Hippuric Acid Test. Arch. Surg. *37:* 427-442 (Sept.) 1938.

CARCINOMA OF THE STOMACH WITH ACUTE PERFORATION, COMPLICATED BY BILATERAL KRUKENBERG TUMORS

Case Report

J. H. Francis, M. D.
Memphis

MRS. G. W. B., aged 43 years, consulted her family physician in March, 1939, because of pain in the upper abdomen and an associated nausea. Her symptoms had begun three years earlier with upper abdominal discomfort. The pain was now practically unremitting and at times severe, especially at night. The nausea, likewise, was fairly constant, though it was never accompanied by vomiting, nor had she had any other digestive disturbances, such as gaseous distention or eructations. With the exception of milk and cream, which seemed to allay her distress to some extent, the ingestion of food gave no relief. At no time had she experienced an attack of acute abdominal pain which might indicate either a cholecystitis or appendicitis. She had no other complaint. Her personal history was otherwise unimportant, as was also her family history.

The physical examination was essentially negative except for a slight tenderness over the upper right and middle abdomen, and an enlargement of the liver. Blood studies, however, revealed less than 4,000,000 red cells and 52 per cent hemoglobin. The stomach acids were normal, though occult blood was found in the stomach contents.

The probable significance of these symptoms and findings was explained to the patient; nevertheless, she refused to have a roentgenologic study or any further investigation. Under this circumstance, liver therapy and a mixture containing belladonna were prescribed.

In May, 1940, she returned to her physician because of an increase in the epigastric pain. The physical findings on that occasion did not differ materially from those of the previous examination, fourteen months earlier, and the blood picture had changed but little, the red cells still numbering less than 4,000,000 and the hemoglobin being 60 per cent. Since a complete examination was again declined, she was given a course of 24 injections of larostidin.

On her next visit to her physician, three months later, the patient was found to be in a state of extreme exhaustion and was therefore sent immediately to the Methodist Hospital in Memphis. It was there that she first came under the author's observation.

At this time, she complained of profound weakness, and stated that she had been having black stools for three days; also, on the day before entering the hospital, she had had an attack of upper abdominal cramping and several times had vomited dark, sanguinous material. A blood count showed only 3,000,000 red cells and 46 per cent hemoglobin. She was given a transfusion of whole blood on three alternate days, and by the sixth day of her hospital stay all signs of bleeding had disappeared; in addition, the red cell count had increased to 3,600,000 and the hemoglobin to 63 per cent. She felt much improved and, over all protests, returned to her home.

Nothing further was heard from the patient until November, 1941. She then reported to her family physician, stating that she had grown progressively weaker and was ready for any treatment he suggested. In the interim, she had been compelled to resort to a liquid diet, as solid food had begun to cause exacerbations of the upper abdominal pain. She was again sent to the hospital.

On examination, the abdomen was found to be enormously distended with fluid and, as a consequence, it was impossible to palpate either the abdominal or pelvic organs. A roentgenogram made following the ingestion of barium demonstrated a large filling defect involving the entire pars media of the stomach. There was no evidence of obstruction. The diagnosis was carcinoma of the stomach.

From the time of her admission to the hospital, the patient suffered almost continuously with upper abdominal pain. On the second night, the pain suddenly became agonizingly acute, she immediately went into shock, and despite every supportive measure, died twelve hours later. A postmortem examination was made, which showed the following:

The abdominal cavity contained 2.5 liters of thin, turbid, chylous fluid, in which numerous strands of fibrin were found. The peritoneum and all the abdominal organs were covered with a fibrinous exudate.

On the anterior and inferior wall of the stomach in the midportion there was an irregularly shaped perforation measuring approximately 7 mm. in diameter, through which the stomach contents had free access to the peritoneal cavity. Upon opening the stomach, this perforation was found to be in the center of a circular tumor. The tumor crater was necrotic and indistinctly outlined, and the base of the mass, as well as the surrounding stomach wall, was firm and fibrous. The mucosa was congested throughout the stomach, from the cardia to the pylorus. The small and large intestines appeared normal.

On examination of the pelvic organs, no gross changes were detected in the uterus and vagina. The ovaries, however, were peculiarly interesting. Both were lying in the culdesac, were considerably enlarged, lobulated, and of a reddish color. On measurement, the right ovary was 7.5 by 3 by 3 cm.; the left, 8 by 5 by 4 cm. When opened, they were found to contain a few simple cysts and a large amount of gelatinous material. These changes were more pronounced in the peripheral areas, the centers being practically normal in structure. The fimbriae and tubes were somewhat congested. There were no glands in the retroperitoneal region.

The anatomic diagnoses were:

1. Perforated carcinoma of the fundus of the stomach;
2. Bilateral Krukenberg tumors of the ovary; and
3. Generalized fibrinous peritonitis.

The pathologist's report of the microscopic findings were as follows:

"*Stomach:* The stomach wall was deeply infiltrated by the malignant process, and at the site of the perforation had undergone necrosis. Sections through the margin of the tumor showed a distinctly colloid type of growth: the cells were typical. The arrangement was glandular, and the nuclei were usually small, with a great deal of clear cytoplasm. The cell membranes were clearly outlined.

"*Ovary:* All the ovarian tissue had been replaced by a tumor which was similar in appearance to that of the stomach. There was an occasional corpus albicans which was completely surrounded by tumor elements. The myxomatous appearance of this tumor was striking. Long strands of malignant tissue were separated by fibrous tissue, in columnar fashion. The cells were identical to those seen in the stomach: they had small nuclei, which were usually eccentric in a large amount of clear cytoplasm. The vessels coursing throughout the tissue were congested.

"*Lymph Glands:* Section of a lymph gland taken from the serosal surface of the stomach showed its structure to be practically entirely replaced by carcinomatous tissue. The capsule was invaded, and there were tumor elements on the outside of the gland. The cellular detail was identical with that of the tumors of the stomach and ovary. A small amount of fibrosis was also apparent.

"*Diagnosis*: Adenocarcinoma of the stomach with Krukenberg tumors of both ovaries."

Comment

Carcinoma of the stomach complicated by acute perforation is not unusual. The outstanding feature of this case is the association of a tumor of both ovaries identical in structure to that of the stomach. Such ovarian tumors, first described by Krukenberg in 1896, are believed to be almost invariably secondary to gastric carcinoma. Their chief interest lies in the fact that they are exceedingly rare, and it is for this reason that the present case is reported.

SOME FUNDAMENTALS OF PLASTIC REPAIR

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New Orleans

THE study of the repair of wounds, the factors involved in the process of wound healing, and methods by which healing may be produced, are matters of deep interest to every surgeon. Changing ideas of infection have brought with them throughout the years an evolution of thought and judgment as to means of combating it, and each new discovery has done its share in helping to further more rapid recovery. Whether operative, or the result of trauma, the surgeon's interest in the promotion of wound healing is the same; but whereas the surgical wound is protected from contamination by every known means, the traumatic wound is the result of uncontrolled factors and contamination is the rule, rather than otherwise. It is all types of wounds that engage our attention, but in particular, the methods of surgical care in trauma, and the sequelae of trauma, which may be employed to promote prompt healing, with the least possible scarring and loss of function.

The care of traumatic wounds has presented to man a serious difficulty since his early days, both in times of peace and in periods of war. Modern life and the complexities of the machine age have multiplied the problems of trauma, both as to kind and incidence. The first World War gave the opportunity for intensive study of all types of wounds and knowledge gained by surgeons at this time has been the basis for later investigation and procedures for use in the ever-increasing numbers of traumatic wounds in civil life in these past twenty years. The present war is presenting new types of wounds, and bringing forward certain changes in care and treatment. With this idea in mind, it is believed that certain principles of surgical care might profitably be reviewed from the standpoint of the plastic surgeon.

From a bacteriologic point of view, every wound is either sterile, contaminated or infected. We speak of surgical wounds as sterile, although it is probable that no wound is actually sterile bacteriologically. Surgical wounds, however, are produced under conditions as nearly aseptic as is possible, and under the most ideal conditions from the standpoint of healing and repair. Traumatic wounds, on the other hand, are produced under unsterile conditions, and are often further affected by efforts toward first aid. Wounds so produced containing on their surfaces or in their depths, foreign bodies, bits of clothing and microorganisms, are said to be contaminated. This condition of contamination lasts for six to forty-

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eight hours, depending on the type of organisms present, the kind of care which the wound has received, the physical condition of the patient and the promptness with which adequate surgical attention has been available. The wound may then pass into a state of infection in which bacteria have invaded surrounding tissues, producing a reaction between the host and the invading microorganisms.

Certain general factors may influence the process of wound healing. The age of the patient is a matter of primary consideration as well as his general health and defense factors against tissue damage. The presence of another and entirely unrelated infection may change the entire course of healing of an infected wound. Diet and the balance of endocrine secretion play an important part. Vitamins A and C have been found to accelerate the process of healing. Immobilization is of undoubted aid, in lessening the chance of further trauma to the wound. Recent investigations lead one to conclude, however, that the presence of simple, surface infection within a wound does not necessarily retard the healing process, but exerts an indirect rather than a direct influence upon it, since cicatrization is thereby stimulated.

Wounds are said to heal by first intention, or by second intention, the distinction between the two being quantitative rather than qualitative. Healing by first intention is therefore the result toward which we direct our efforts.

There can be no fixed law or standardization for the care of all traumatic wounds, if the best results are to be achieved. Correct handling in each case will depend on the type of wound, its location, the extent of contamination and the general physical condition of the patient. First aid should be directed toward control of hemorrhage, relief of pain, control of shock, immobilization and protection of the wound from further injury. Where the presence of bacillus tetanus, bacillus of gas gangrene or streptococcus hemolyticus is suspected, prophylactic inoculation is of course indicated and should be administered. In the avoidance of further trauma, great care should be given to the transportation of the patient to a place where examination may be complete, and where proper treatment may be instituted as soon as possible. The delay of several hours may convert a contaminated wound, capable of being cleansed and of healing by first intention, into an infected one with wide scarification, disfigurement and impairment of function.

Since the factors involved in wound healing will depend in part on the presence of some independent infection or general disease in the body, examination of the patient must include note of any other illness present or a predisposition to systemic disease. Suc-

cessful care may often hinge on careful observation in these cases and the adaptation of treatment to the particular need of the individual patient. Complete information concerning how the injury occurred should be secured from the patient, or if he is unconscious, from spectators. Every effort should be made to determine whether loss of sensibility may be due to shock, or to diabetic coma, epilepsy, apoplexy, alcoholism, etc. Unconsciousness may indicate cerebral injury if it is associated with hemorrhage from the mouth, nose or ears, in the presence of a slow pulse. The aid of the laboratory and x-ray may be invoked when necessary to determine the extent of the injury. The care of the wound is always secondary to the saving of life.

Fig. 1. Diagrammatic sketch of Gillies-Kilner temporal approach for malar-zygomatic fracture with long, slender, strong elevator, passed under zygoma levering malar bone upward and outward (From Gillies-Kilner).

Completing the general examination of the patient as expeditiously as possible, the surgeon should direct his attention to the care of the injured part. Choice of anesthetic will depend on the extent of the injury and the condition and age of the patient. In serious wounds, or in treating injury in children, general anesthesia presents distinct advantages, in aiding sterilization and more complete examination of the wound and the approximation of tissues. In simple wounds an injection of morphine and local anesthesia may be sufficient. In extensive injury, where general inhalation anesthesia is contraindicated, intravenous sodium pentothal local anesthesia or spinal analgesia may be utilized depending on indications. The use of a pack of 1 per cent solution of procaine applied to the wound for 5 to 8 minutes, has been recommended by

Fritz and Tanner in incised, lacerated or contused wounds of moderate degree.

Under anesthesia, the original dressing may be replaced with a sterile one, while the area surrounding the wound is thoroughly cleansed and shaved to prevent further contamination. Draping the wound aseptically, it should be freely washed with soap and water, using cotton swabs and frequent douching with large quantities of sterile water. This may be followed by a douching with 70 per cent alcohol, and with ether. Strong germicidal solutions and antiseptics such as iodine, merthiolate, mercurochrome, etc., definitely have no place in recent devitalized wounds, although they serve a useful purpose on the normal skin surrounding the traumatized areas. The

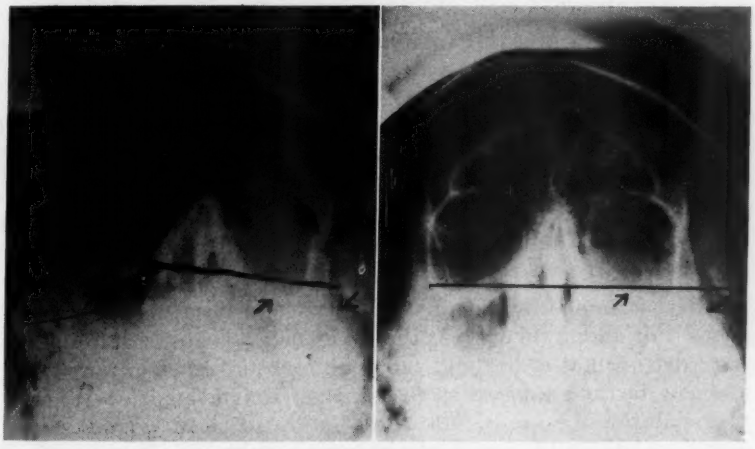

Fig. 2. A. X-ray of malar-zygomatic fracture. (a) Lower fragment displaced inward, malar bone depressed into antrum—depression of zygomatic arch.

B. Same case, following reduction by Gillies-Kilner technic.

dictum that any substance sufficiently potent to kill bacteria is likewise sufficiently strong to destroy devitalized tissue cells should be borne in mind. The direct application of sulfanilamide powder or its related substances into the bed of wounds before closure, is an important recent addition to wound therapy which has reduced the incidence of infection to an amazing degree.

Redraping the wound, careful exploration should be made with sterile instruments for the detection of remaining foreign bodies, bits of bone, muscle or tendon. Treatment must depend on the extent of contamination or infection. Wherever general conditions permit, and tissue damage is slight, the wound should be excised en masse, followed by primary suture by direct approximation or

by means of a graft or flap. Thorough debridement, change of gloves and instruments to prevent spreading contamination from one wound to another, should be rigidly carried out. Great care and patience should be taken in the immediate and exact approximation of parts. Slight, shallow wounds may be closed by several sutures, each incorporating all layers of the wound. In the case of extensive wounds, however, layers should be closed individually in tiers; fascia and aponeurosis should be carefully approximated, so that the wound surfaces may be held in a position at least approaching normal. Skin edges should be sutured without deviation and without inversions in order to minimize scar formation. Fine suture material, fine silk, horsehair, silk worm gut, dermal, cotton, etc., as interrupted sutures closely placed, should be used and removed early; 24, 36, 48 hours or a few days. When provision for relaxation is necessary, this may be secured by means of relaxation sutures, so located as to transfer tension to the required distance from the primary line of closure; the greater the need for relaxation, the greater the distance of the tension sutures from the wound margin. Tension sutures should be used with great judgment since the cross suture scarring (stepladder), when present in exposed areas, is often a greater problem in management than the original traumatic scar. On the face and within the mouth, retention sutures can often be placed from the inside.

The question of suture material has long been argued by surgeons. For a long time it was the belief that non-absorbable sutures were detrimental to healing, acting as foreign bodies in the wound and as a factor predisposing to infection. It remained for Whipple to popularize the use of silk in the suture of clean wounds, as recently as 1933, although Halsted was probably the first to recommend its employment. It is now generally believed that catgut is a possible cause of wound infection; it certainly carries with it a high degree of tissue reaction, and the difficulty of its sterilization has been recently demonstrated by experiment. It has been proven to be unreliable when knotted under pressure unless tied by a triple or quadruple throw knot.

In a recent investigation by Meade and Ochsner, the great advantage of cotton as a suture material was clearly demonstrated. It was shown that cotton has less tendency for tissue ingrowth. It is pliable, easily sterilized, non-irritating, inexpensive and of sufficient strength in most surgical procedures, in size No. 30 for approximation of fascia, size No. 20 in retention sutures, and size No. 60 for ligature of small vessels, of subcutaneous fat and other areas. For skin closure, black cotton is used because of the tendency of white to become blood-stained, and thus more difficult to locate.

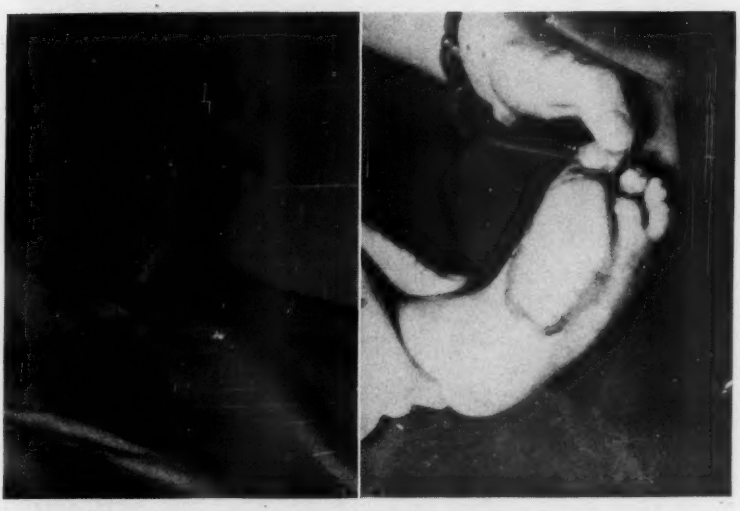

Fig. 3. A. Extensive burn contracture of left foot, showing:

(a) Great toe buckled and fixed in acute forced flexion.

(b) Little toe enclosed in dense scar tissue and displaced. Ankylosis at metatarsal joint.

(c) Ulcer between great and first toe, the latter also bound down by dense scar tissue.

B. (a) Same case, following complete excision of scar tissue, freeing and extension of great and first toes and disarticulation of little toe; pedicle graft from right thigh to sole of foot.

(b) Split graft covering outer side of foot in area where little toe was removed.

(c) Patient now walks and runs without limp.

Cotton has been found to produce the least reaction and earliest healing. The experience of the author in the repeated use of cotton sutures in facial wounds and under grafts where ligatures were found necessary, has completely corroborated these observations.

The problem of burns and their management is one which has invited a great deal of thought and diversity of opinion. Much is being done in the present war to improve the handling of the burned patient and better end results functionally and otherwise will undoubtedly follow.

In extensive burns, in the presence of islands of epithelium, healing will be attained eventually if the surface is kept clean and granulation is stimulated. If, on the other hand, tissue destruction is so extensive that no germinal epithelium remains, early skin grafting is emphatically indicated in the prevention of contraction and deformity. The patient's general condition should be brought to the best possible state as a preface to such surgical resurfacing. Infec-

tion of the wound should be eliminated and the area covered with a layer of cellophane, perforated to permit escape of secretion. This is followed by the application of a sterile dressing wrung out of boric acid or normal saline solution. Over this is placed a rubber covering and a bandage. The dressing should be maintained at a

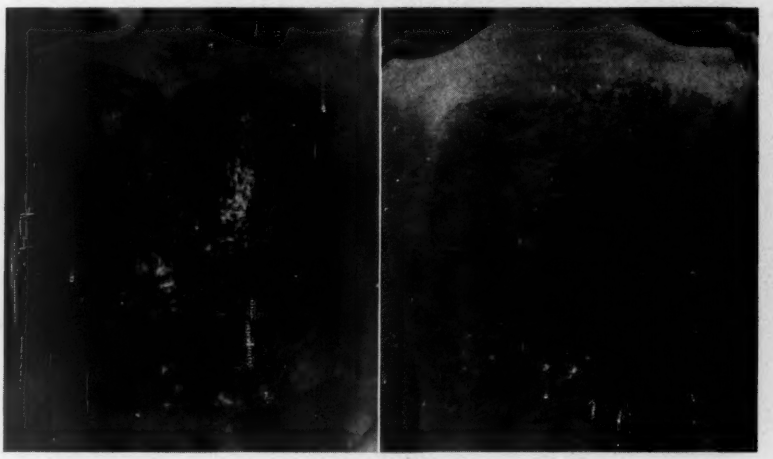

Fig. 4. A. (a) Extensive second and third degree burns of back, showing excess granulation.

(b) Patient seen 8 months after the burn and running septic temperature.

B. (a) Same case healed, following multiple split grafts in a three stage procedure.

(b) Temperature reduced as soon as half raw surface was covered.

warm temperature by means of an electrically heated cradle. In case oozing continues, dry heat may be used to attain a firm, pink granulation.

The plastic surgeon is frequently called upon to repair scarring, and to restore function to a part deformed by contracture following severe burns. Where deformity is slight, repair may sometimes be effected by physiotherapy. In the persistence of contracture, however, surgical repair is necessary, the procedure depending on the type of scar, deformity and tissue loss. Repair in each case will consist of excision of scar tissue, re-approximation of parts and the covering of any remaining defect with healthy tissue. The complete excision of scar tissue is usually advisable, followed by direct closure of parts, gradual stretching to overcome contracture and the application of a full thickness or thick split graft or flap. Scars of the face may best be repaired by skin from the eyelids or from behind the ear. When larger grafts are necessary, skin may be secured

from more distant sites. The Z-plastic operation has been found to give good results in some cases of scars of the neck, which draw the chin down and to the side, and those of the axilla, in which the arm is drawn to the thorax; the face scars are repaired by direct skin grafts.

Fig. 5. A. Scar following lacerated wound of face, showing invagination of skin edges and stepladder retention suture scarring.

B. Same case, following excision of old scar, including stepladder retention suture scars by side undermining of skin and resuture. Tension sutures healed.

Small flat scars, resulting from burns may be completely excised with a direct approximation of parts, in the manner in which other types of scars are cared for. Larger, flat scars may be removed by the successive operations for partial excision. This method is sometimes used also in reducing the size of extensive disfiguring scars, in tattoo marks, and in the so-called "foreign body tattoo" from road and industrial accidents.

It has been aptly said that the best dressing for raw surface areas is skin. Within the past decade, the advances made in skin coverage comprise one of the most romantic chapters in surgical history. The repair of surface and soft tissue injury and deficiency, has been given an impetus of certainty and assurance by the contributions of Blair, Barrett, Brown, Filatov, Gillies, Davis, Padgett, and many others. The tube pedicle graft of Filatov, independently devised by Gillies, who further broadened its scope of usefulness and its indications, as well as the split-graft of Blair and Brown,

and the dermatome of Padgett, facilitating the taking of grafts and the rather accurate calibration of known thicknesses of skin, represent epochs of plastic repair.

The choice of graft depends on location and area of the surface to be covered, on the depth of the deficiency, as well as the state of granulation and the general condition of the patient. Free full thickness grafts have the advantage of closely matching normal skin in appearance and function with little tendency to contraction; on the face and surface of the hand, as well as on the neck, they find their best application. Their great disadvantage is their uncertainty of take either in part or whole on granulating surfaces or over large areas. Their tendency to bleb formation and to pigmentation is well recognized and when this occurs the cosmetic result is poor. For this reason thick split grafts give best results both as to appearance, stability and more certainty of take, and are advised if granulation is reasonably healthy, or the vascularity of a fresh wound is found adequate. Thin razor grafts may be used on a less aseptic surface; they cause less shock but are more subject to contracture. In the presence of infection, small deep grafts may be employed; these are conducive to scarring but grow easily and can be applied under local anesthesia. Implantation grafts have been recommended, but I have had no experience in their use.

Special care should be devoted to the dressing of wounds to which a graft has been applied, since the graft must be completely immobilized by a dressing which is non-adherent and absorptive, exerting an even pressure and at the same time protecting the wound. The layers of dressing immediately over the grafted area should be xeroform gauze, merthiolate gauze or similar substances, the gauze being of wide mesh to allow the escape of serum, etc. The first layer of gauze may be lightly sutured to the surrounding skin to prevent shifting. The ointment impregnated gauze is then overlaid by a pad of gauze trimmed to the size of the wound and wrung out in saline solution. This is followed by successive layers of dry gauze, each slightly larger than the one before. Great care should be used in avoiding wrinkles in the dressing, since these may increase unevenness of pressure and reduplication of the graft. After the application of 5 or 6 layers of plain gauze, a layer of fluff gauze is applied, followed by more plain gauze, used as a compression bandage, supplemented by adherent plastic bandage. The pressure exercises the important function of holding the graft to its bed, eliminating dead spaces, controlling oozing and minimizing contraction. Compression bandages likewise minimize infection by preventing serum accumulation and also seem to inhibit bacterial growth. Sea sponge, rubber sponge, mechanics' waste (Brown), or

Fig. 6. A. Burn contracture of right axilla with marked limitation of motion. B. Same case, following Z plastic flap operation with shifting of flaps and coverage of remaining raw surface with Davis pinch grafts.

inflated balloons, properly sterilized, may be used, bandaged over the wound tightly enough to eliminate one-third to one-half of the spring of the material used. Sufficient pressure should be employed to hold the graft closely to its bed without obstructing capillary circulation; the amount of pressure used in each case will depend upon the size, type, and location of the graft. Complete immobilization of the graft for several days is most important, to prevent shifting and hemorrhage. Theoretically, in the absence of complications, this pressure dressing should not be removed for 10 days to two weeks, giving opportunity for the graft to become firmly attached to its bed. It is usually wise, however, to examine the wound on about the seventh postoperative day. If temperature is present a few days following the application of the graft, the wound should be immediately inspected. If healing is progressing satisfactorily, a similar dressing may be replaced. If complications are developing, they may be promptly cared for before too much progress has been made. Too great stress cannot be made on gentle handling of dressings.

Deformities of the face other than those of traumatic origin are the congenital defects and those due to disease. The nose, lips and palate are the most commonly affected, although none of the facial

features are exempt. Abnormalities of the nose, the most prominent feature of the face, are of frequent occurrence. Hump nose, deflected tip and septum deviation are conditions, the psychologic reactions of which are legitimate cause for plastic repair. Of the disease group, syphilis and lupus are common examples. Principles of correction here include reduction in size, to harmonize with other facial features, and restoration of abnormally placed structures to their proper anatomic alignments. The distressing disfigurement of harelip, with its accompanying functional deficiency, and that of clefts of the palate associated with disorders of speech and deglutition, are common.

The objectives in lip repair are fourfold; equal length of both sides of the lip, a regular vermilion border, a good nasal floor and correction of nasal deformity. In palate repair, the ideal in correction lies not only in a satisfactory closure, as in past years, but in improvement in speech mechanism and voice. In this connection, the palate elongation operations of Dorrance, Vaughan and Brown have done much to restore these unfortunates to a proper place in society.

Facial fractures have become more and more common due to the mechanization of our life, automobile mishaps, industrial accidents and casualties of war. Fractures of the nose, mandible, superior maxilla and malar-zygomatic compound are of frequent occurrence. Prompt restoration along anatomic and physiologic lines is fundamental, as in all fracture management. These structures, however, call for specialized methods of reduction and immobilization, and their handling requires patience, care and particular attention to details.

In conclusion may we add a word as to the psychologic reaction of the patient to plastic repair. Much has been said in medical literature as to the influence of mental processes on the physical being. Quite as important, in cases of deformity and disfigurement, may be the effect of these disabilities on the mental state of the patient. Consciousness of such abnormality may induce morbid sensitiveness and various associated inhibitions; or, in reaction to realization of disfigurement, there may be developed defense mechanisms which seriously interfere with one's adaptation to living. In either case, neuroses may be found, which in their turn will effect physiologic relationships. The plastic surgeon may be said to operate not only on the patient's physical being, but in many cases on his personality as well; and any disfigurement, congenital or acquired which is sufficiently obvious to affect one's adjustment to normal living, is worthy of the surgeon's art in its repair.

REFERENCES

1. Bettman, A. G.: Tannic Acid and Silver Nitrate in Burns, Surg., Gynec. & Obst. *62:* 458-463, 1936.
2. Blair, V. P., and Brown, J. B.: Use and Uses of Large Split-Skin Grafts of Intermediate Thickness, Surg., Gynec. & Obst. *49:* 82-97, 1929.
3. Browne, D.: An Orthopedic Operation for Cleft Palate, Brit. M. J. *2:* 1093-1095, 1935.
4. Dorrance, G. M.: The "Push-back Operation" in Cleft-palate Surgery, Ann. Surg. *101:* 445-459, 1935.
5. Douglas, B.: Advances in the Treatment of Everyday Wounds, South. M. J. *32:* 1171-1185 (Dec.) 1939.
6. Filatov, V. P.: Plastie atige ronde, Vetnik. oftal. no. 4-5, 1917.
7. Fomon, S.: Surgery of Injury and Plastic Repair, Baltimore, Williams & Wilkins, 1939, p. 1409.
8. Fritz, M., and Tanner, E. K.: Novocain Pack; A Contribution to the Therapy of Fresh Accidental Wounds, New York State J. Med. *35:* 1217-1218, 1935.
9. Gatch, W. D.: Some Considerations on Wound Healing, SOUTH. SURGEON *7:* 505-516 (Dec.) 1938.
10. Gillies, H. D.: Tubed Pedicle in Plastic Surgery, New York M. J. *111:* 1-4, 1920.
11. Halsted, W. S.: The Employment of Fine Silk in Preference to Catgut and the Advantages of Transfixing Tissues and Vessels in Controlling Hemorrhage, J. A. M. A. *60:* 1119-1126, 1913.
12. Hardin, P. C.: Cod Liver Oil Therapy of Wounds and Burns, SOUTH. SURGEON *10:* 301-338 (May) 1941.
13. Horine, C. F.: Some Physical Factors Regarding Catgut Sutures and Catgut Knots; Preliminary Report, Ann. Surg. *112:* 471-479 (Sept.) 1940.
14. Ivy, R. H., and Stout, R. A.: Emergency Treatment of War Injuries of the Face and Jaws, Ann. Surg. *113:* 1001-1009 (June) 1941.
15. Johnson, P.: Wound Healing, West. J. Surg. *48:* 415-423 (July) 1940.
16. MacCollum, D. W.: Early and Late Treatment of Burns in Children, Am. J. Surg. *39:* 275-311 (Feb.) 1938.
17. Maltz, M.: New Faces—New Futures; Rebuilding Character with Plastic Surgery New York, R. R. Smith, 1936, p. 315.
18. Meade, W. H., and Ochsner, A.: Relative Value of Catgut, Silk, Linen and Cotton as Suture Materials, Surgery *7:* 485-514 (April) 1940.
19. Meade, W. H., and Ochsner, A.: Spool Cotton as a Suture Material, J. A. M. A. *113:* 2230-2231 (Dec. 16) 1939.
20. Murless, B. C.: Treatment of Infected Burns, Brit. M. J. *1:* 51-53 (Jan. 13) 1940.
21. Ochsner, A.: Wounds, New Orleans M. & S. J. *81:* 746-754; 826-833, 1929.
22. Padgett, E. C.: Calibrated Intermediate Skin Grafts, Surg., Gynec. & Obst. *69:* 779-793 (Dec.) 1939.
23. Padgett, E. C.: Skin Grafting in Severe Burns, Am. J. Surg. *43:* 626-636, 1939.
24. Reid, M. R., and Carter, B. N.: Treatment of Fresh Traumatic Wounds, Ann. Surg. *114:* 4-18 (July) 1941.
25. Thompson, M.: Local Treatment of Wounds, Am. J. Surg. *27:* 302-310, 1935.
26. Vaughan, H. S.: Important Factors in the Treatment of Cleft Lip and Cleft Palate, Ann. Surg. *84:* 223-232, 1926.
27. Vaughan, H. S.: Surgical Repair of Cleft Palate, with Special Reference to Lengthening of Soft Palate, Am. J. Surg. *31:* 5-9, 1936.
28. Whipple, A. O.: Use of Silk in the Repair of Clean Wounds, Ann. Surg. *98:* 662-671, 1933.

THE TREATMENT OF VARICOSITY OF LOWER EXTREMITIES

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CONTRIBUTIONS of inestimable value of a group of distinguished workers in Europe and America have perfected the modern treatment of varicose veins. The dramatic evolution in the treatment of this condition is a brilliant chapter of medical history.

The subject has acquired an enormous literature. One hesitates to give repetition of facts that are well known to you. My only interest is to review the present-day clinical information on this subject which has proven satisfactory in my personal experience for almost twenty years.

The use of sclerosing solutions in the treatment of varicose veins has proven satisfactory. Ligation of the saphenous vein at the saphenofemoral junction, when indicated, increases the chance of permanent cure. In my own experience, recurrences are becoming more infrequent because of proper selection and classification of the patients.

The internal saphenous vein is supplied with from ten to twenty valves. The column of blood must ascend against gravity. The valves in the saphenous vein help to break the pressure of the column of blood. There is a valve at the junction of the saphenous with the femoral vein. When this is incompetent, the whole force of the blood column in the iliacs and inferior vena cava is thrust upon the internal saphenous.

The factors responsible for the origin of varicose veins may be classed as: (1) congenital, (2) hereditary, and (3) acquired.

Careful study of patients suggests that a large number of varicose veins are congenital.

All factors, including pregnancy, puberty, obesity, sudden loss of weight, infection, traumatism, and occupation, may be classified under the acquired group.

The indications for the treatment of varicose veins far exceed the contraindications. If one is familiar with the countraindications, the indications will be clearly understood. The chief contraindications are:

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1. *Degenerative diseases, severe cardiovascular disease, diabetes, nephritis, and hyperthyroidism.*—A general physical examination should rule out these conditions.

2. *Acute local or general infection.*—The treatment should be postponed until the patient is free from such conditions.

3. *Pregnancy.*—Experience has proven that a better result will be obtained if the treatment is postponed until a few weeks after the termination of pregnancy.

4. *Chronic varicose ulcer.*—The treatment should be postponed until the ulcer is healed or free from infection. The morbidity following hurried treatment in these cases is discouraging.

5. *Arterial obstruction.*—The patient should be carefully examined for arterial disease of the lower extremity before any treatment is undertaken. A careful history and analysis of symptoms should be made. The pulsation of the dorsalis pedis and posterior tibial arteries is absent in senile arteriosclerosis. The dorsalis pedis artery can be felt in a line passing between the bases of the first and second metatarsal bones. The posterior tibial is palpated well behind the internal malleolus.

Samuel's test should be made to rule out thrombo-angiitis obliterans. It is made by elevating the legs to an angle of 90 degrees with the patient in reclining position. The patient rapidly flexes and extends both feet, using the ankle joints as pivots. If the plantar surfaces of the feet become blanched and the normal pink color fades with presence of pain in the calf, there is arterial disease of the extremities present. Blanching may extend upward, depending upon the extent of arterial obliteration. In doubtful cases the histamine acid phosphate test should be tried.

6. *Phlebitis and thrombophlebitis.*—A history of "milk leg" requires painstaking examination. Treatment should not be given until patency of the deep veins has been demonstrated. To determine the condition of the deep veins, Perthe's test is used as follows:

(a) The patient assumes a standing position. To constrict the superficial veins, a thin rubber tube tourniquet is tied tightly above the varicosity. If the dilated veins extend above the knee, the tourniquet is applied above the upper thigh.

(b) The patient is instructed to flex and extend the knee at least ten times or to walk back and forth ten times. If the veins collapse during the exercise, the deep veins are patent and treatment is absolutely indicated. If the distended superficial veins show no diminu-

tion, but bcome more turgid during the test, the deep veins are not patent and the treatment is absolutely contraindicated.

The normal flow of blood in the venous system of the lower extremities is from foot upward through the saphenofemoral valve; also from superficial veins to the deep through the intercommunicating veins. It is absolutely clear that normally there is neither back flow of blood through the saphenofemoral valve nor from the deep venous system to the superficial by the intercommunicating vessels.

To secure a satisfactory result following treatment for varicose veins, every patient should be classified according to the findings of the various tests.

The three tests, (Trendelenburg, Schwartz, Ochsner and Mahorner), described for this purpose, are quite simple and the importance of these tests could be briefly stated as follows:

(a) When there is dilatation of superficial veins of the lower extremity without disturbance of the normal flow of venous blood, adequate injection of sclerosing solution will prove satisfactory in the majority of patients. This condition is determined by negative Trendelenburg test.

(b) If backflow of blood through an incompetent valve in the saphenofemoral junction is present, a high ligation and sectioning of saphenous followed by obliteration of varicosities is indicated. This condition is demonstrated by Trendelenburg single positive and Schwartz tests.

(c) Incompetency of one or more valves of the communicating veins of the thigh between the superficial and deep venous system requires additional ligations in the lower level. Ochsner and Mahorner described the comparative tourniquet test which accurately demonstrates this condition.

(d) The Trendelenburg double positive test demonstrates incompetency of the valves of the communicating veins of the whole lower extremities, including the calf and the lower leg.

The Trendelenburg test is made as follows: With the patient in a reclining position on a table, the affected leg is elevated to a vertical position for two or three minutes to empty the superficial veins. A tourniquet of thin rubber tubing is then tied around the middle of the thigh tightly enough to compress the superficial veins, the leg is lowered, and the patient assumes a standing position. If the veins remain empty or slowly become dilated by blood flow from below, the test is negative. If the veins fill suddenly when the patient stands with the tourniquet still tightly on, the test is doubly positive. This indicates that there is a valvular insufficiency of the intercom-

municating veins. If, when the tourniquet constriction around the thigh is released, the veins fill up suddenly from a column of back flow of blood from above downward, the test is positive. Such a test demonstrates that there is a regurgitation of blood into the saphenous vein because of incompetency of the saphenofemoral valve.

To demonstrate incompetency of the saphenofemoral valve, the Schwartz test should be tried routinely in conjunction with the Trendelenburg test. This is performed by placing two fingers of one hand over the saphenous bulb in the groin over the fossa ovalis, while percussion is made by the fingers of the other hand lower down in the distal end of a dilated long saphenous vein. The process of percussion should be reversed. When the percussion gives a strong, definite impulse to the examining fingers, it demonstrates that the saphenofemoral valve is incompetent.

Careful examination is necessary to determine the patency of the saphenofemoral valve in obese individuals where the saphenous veins may be buried deeply in fatty tissues. Trendelenburg and Schwartz tests may have to be repeated and correctly interpreted. Sometimes it will be necessary to palpate saphenous in various locations of the thigh with the patient in different positions.

Ochsner and Mahorner's comparative tourniquet test is made in all patients who have large varicosities in the middle or lower third of the thigh. In going over a large number of patients with recurrences following ligation and injection treatment, I found that incompetency of the valves of one or more of the intercommunicating veins in the thigh was the chief cause of failures.

This test is made by having the patient in a standing position. The tourniquet is applied to the upper third of the thigh sufficiently tight to compress the superficial veins. The patient walks back and forth. If there is diminution of the dilated veins of the calf and the legs, high ligation of the saphenous will be sufficient to stop the back flow. If no diminution of the veins occurs, the tourniquet is likewise applied in the middle of the thigh and the patient walks over the same course. Diminution of the veins of the calf and leg suggests that an additional ligation will be required in that location. If no diminution of the veins follows, this test is repeated in the lower third of the thigh. The diminution of the veins following the test suggests that a ligation will be necessary in that location in addition to a high one (saphenofemoral).

We also found an incipient group where the back flow through the saphenofemoral valve could be easily demonstrated but the lower level of the leaks between the superficial and deep venous

systems could not be clearly determined until sometime after a high ligation. Whenever this condition is discovered, an additional ligation in the lower level of the thigh will be necessary to get a satisfactory result.

Injection Technic

For the past ten years we have limited our use to 4 sclerosing solutions: 5 per cent sodium morrhuate; monolate (5 per cent ethanolamine oleate); soricin (2 or 3.5 per cent sodium ricinoleate); synasol (5 per cent solution of sodium psylliate).

One half to one cubic centimeter of a solution is injected for the first sitting. If no reaction occurs, in subsequent treatment 2 to 5 cc. of sclerosing solution is used. Three or four segments may be obliterated at a time. The patient returns for injection once a week, but I do not hesitate to postpone treatment for a week or longer if a severe local reaction is present from previous injection.

In the majority of cases, the injections are given with the patient in the upright position. It is important to inject the veins in a systematic way. For the first injection, a vein as low in the leg as possible is selected. After all the veins between the knee and the ankle are obliterated, the veins in the thigh are attacked.

The only instruments necessary for the injection treatment are a 26½ or 27 gauge hypodermic needle and a glass syringe. The site to be injected is cleaned with an alcohol sponge. After introduction of the needle, the piston of the syringe is slightly withdrawn to determine whether the needle has entered the vein. If the needle is in the vein, blood will flow back into the syringe. If there is any doubt as to its position, it is removed and introduced into another segment. If this precaution is taken before the injection is given, sloughing will never occur. A small folded sterile dressing is applied on the punctured spot and held tightly with an adhesive strip about 1½ inches wide. If desired, a pressure bandage may be applied at the point of injection. The patient is instructed to remove this dressing at the end of 24 hours.

Technic of Saphenous Ligation

The highest point for ligation (bulb) can be palpated by having the patient stand with full weight on the affected leg. If there is difficulty in locating it, the patient is requested to cough or strain. This makes the bulb easily palpable. The bulb is marked with a 2 per cent solution of brilliant green or methylene blue. The patient is then put in the recumbent position and the field of operation is surgically prepared.

One per cent novocain with 3 drops of adrenalin to the ounce is used for anesthesia. A *transverse* oblique incision about 2½ inches long is then made about 1 inch below Poupart's ligament, passing through skin and subcutaneous tissue. The saphenous is buried in the fibrous and fatty superficial fascia and just outside of the deep fascia. The superficial fascia is stripped bluntly with a curved hemostat which is passed slowly under the vein in order to separate the vein from the posterior sheath. The vein is carefully stripped of fat and areolar tissue. Two ligatures of No. 1 chromic catgut are applied ¼ inch apart as high as possible, and two similarly spaced ligatures applied 1½ inch distally. The vein is sectioned between the two sets of ligatures. Before applying the lowest tie on the distal portion of the vein, 3 c.c. of the sclerosing solution is injected into it by peripheral puncture with a 27 gauge needle. The last catgut tie is then made just distal to the puncture point.

It has been my custom to remove a segment of the saphenous vein during ligation. Undoubtedly, in some instances this procedure was not adhered to. I have never seen recurrences caused by re-establishment of ligated and cut ends.

The abnormal pattern of the uppermost part of the saphenous vein is common. Painstaking care should be taken to ligate any of the uppermost tributaries present. This is done routinely whenever the external pudendal, superficial circumflex iliac, and superficial epigastric veins empty into the upper end of the saphenous vein instead of into the femoral vein. The accessory veins, lateral or medial femoral, are in the great majority of patients located too far distally to expose during high ligation. In some instances one of them may be located quite high and anterior to the saphenous and may be ligated by mistake as the saphenous vein. The branches and accessory veins are ligated with catgut. The wound should be dry before it is closed. The skin incision is approximated with four or five interrupted sutures of dermal or silk.

The wound is covered with heavy dressings, which are held snug with adhesive strips and bandage. On the eighth day the stitches are removed and a small dressing is applied for another week. The injection treatment may follow as soon as the stitches are removed. It is important to remember that walking after ligation is a safeguard against the formation of thrombi and emboli. All of our varicose vein patients receiving treatment are ambulatory. Clamping of the veins with forceps should always be avoided, as it may injure the endothelium, thereby favoring the formation of a thrombus, especially in the proximal end.

Whenever the Ochsner and Mahorner test demonstrates leaks of blood in the lower level of the thigh, I have performd a high and low ligation in one sitting. The levels of additional ligations were determined by the simple comparative test as described and marked with brilliant green or methylene blue. A small transverse incision about an inch long is satisfactory in the majority of cases. The segment of the vein is dissected and excised between two ligatures. The intercommunicating veins could be easily found and ligated. In difficult cases, ligating and cutting just below the incompetent vein will produce desired results. Here again, injection of a sclerosing solution peripherally in the distal end is of value. The wound is closed with interrupted black silk.

The Trendelenburg double-positive test not only demonstrates incompetency of the saphenofemoral junction and of the intercommunicating veins of the thigh, but also incompetency of the veins of the intercommunicating system in the calf and lower leg. I have performed multiple ligations, excisions and segmental obliteration in a fairly large number of patients and, although the immediate result proved satisfactory, the final follow-up was far from encouraging. Linton's operation for the ligation of communicating veins in the lower leg may offer some hope to the patients who present a multiplicity of symptoms caused by venous stasis. My own experience is limited to four such cases and it is too early to draw any conclusions. This operation is of great magnitude and cannot be used as a routine measure. Uncomplicated cases belonging to this group could be made comfortable with a properly fitted elastic stocking or bandage. Fortunately, less than 2 per cent of varicose vein patients seen by me belonged to the Trendelenburg double-positive group.

Varicosities of the lesser saphenous almost always are caused by the pressure transmitted through communications with the long saphenous. In some of my earlier patients I ligated and excised the communicating vein just medially and behind the knee as a special precaution, in addition to the high ligation. This additional step is very seldom necessary. High ligation of the saphenous and obliteration of the small saphenous alone will prove sufficient in the majority of patients. If the lesser saphenous is greatly dilated, it may have to be ligated in the popliteal space, just before it enters the popliteal vein.

Superficial telangiectasis can be treated safely by injection. A very fine needle is necessary in this work. Danger of infiltration and bleeding should be kept in mind.

In patients with superficial thrombophlebitis (not of the acute

and fulminating type) with incompetency of the saphenofemoral valve and patency of the deep veins, I have performed high ligations with good results.

When both saphenous veins require ligation, I have found it advantageous to do one ligation at a time. This makes it possible for the patient to be fully ambulatory.

The patients I have seen with pudendal varicosity during pregnancy almost always had an incompetent saphenofemoral valve complicating this condition. It has been my policy to wait for the termination of pregnancy. A high saphenous ligation with the ligation of pudendal branch has brought permanent cure.

Certain observations made following ligation are of interest:

(a) The dilated veins in the lower extremity were found almost completely thrombosed when the patient was down from the table.

(b) Complete obliteration of the veins after ligation and injection of the distal end was found in a number of cases without requiring any further treatment.

(c) Following ligation, the number of injections necessary to obliterate the varicose veins were much less than when ligation was not performed.

(d) A decrease in the circumference of the leg from ½ to 4 inches following the ligation and injection treatment was noticed in a number of patients.

Comment

Recurrences were common in my service up to 1930, at which time we routinely classified our patients. Recurrences and failures occurred in almost 16 per cent of patients treated up to January, 1940. By adopting additional ligation in the lower part of the thigh whenever indicated, our number of failures dropped to between 6 and 7 per cent by January, 1941. There is a tendency in some patients for recurrence and reformation of varicose veins. Observation of patients at regular intervals and critical investigation of the causes of recurrence and institution of proper treatment will decrease the number of failures.

Varicose Ulcers

After excluding arteriosclerotic, metabolic, specific (tuberculous, syphilitic, actinomycotic, blastomycotic, trophic and malignant [rodent]) ulcers of the leg, there remains a large group (almost 70 per cent) classified as varicose ulcer. In the tropical zone the classification of ulcers of the leg differs greatly from ours.

Varicose ulcers may occur anywhere in the lower half of one or both legs. Also they may be of any size, shape and condition.

The varicose ulcer may be associated with the varicosity of the lower extremity, or may occur in a patient with venous insufficiency caused by thrombophlebitis or phlebitis of the deep veins.

The etiology of varicose ulcer is not clearly understood. Stasis of the venous network causes transudation of plasma throughout the tissue, producing distention. This distention hinders the interstitial circulation and in turn impedes arterial circulation. There is marked lymphatic stasis locally and below the ulceration. The tissues become waterlogged with stagnant serum, which they cannot eliminate. The pressure of distention of this stagnated fluid brings on ulceration with gangrene and separation of the superficial layers of the skin. The ulcerated area becomes infected. Secondary infection may at times be an important factor in the increase in size of the ulcer.

Practically all acute, small varicose ulcers that have not reached the chronic stage, are readily cured by obliteration of veins and application of a mild antiseptic ointment and an elastic bandage.

Partially ambulatory patients suffering from such diseases as heart disease, arthritis, or deformities, with chronic varicose ulcers, are benefited by bed rest and elevation of the leg.

In clinical work I have divided ambulatory patients into two groups: (1) ulcer without edema and with moderate discharge and (2) ulcer with a great deal of edema, a large amount of discharge, and severe pain.

The first group, without edema, can be satisfactorily treated either with Unna's boot or elastoplast bandage. Both are of great value.

The majority of patients under our care at the Surgical Dispensary of the University of Illinois College of Medicine belong to the second group. After experimentation in the various forms of treatment, we have adopted the simple physiologic method suggested by Noble and made popular in this country by McPheeters. The sponge pressure treatment has given us most gratifying results in more than 1500 patients.

The procedure involved in the sponge-pressure treatment is largely mechanical. Pressure of the sponge while walking forces the stagnated lymph and venous blood out of the involved area and thereby improves the circulation with consequent improvement in the healing time. The technic is simple:

(a) The ulcer is cleansed with benzine dressing.

(b) The ulcer is superficially cauterized with 10 per cent silver nitrate solution. (This is only of value in stimulating granulation and is of no value until the severe infection and necrosis have cleared up. We have found that the most favorable time for cauterization was during the second or third week of the treatment.)

(c) A thin layer of soft protective ointment is applied on the ulcer and ulcerated zone. Twelve per cent boric acid ointment has proven satisfactory for our use. This is covered with several layers of sterile gauze dressings. Three or four layers of cellucotton are then applied.

(d) A firm rubber bath sponge, at least one inch larger than the ulcerating area, is held in place tightly with a few turns of a three inch gauze bandage.

(e) A four inch Ace bandage is wound tightly, beginning just below the knee to the toes, making a double figure 8 about the foot and ankle. The greater the swelling the tighter the bandage should be applied.

The patient's complete cooperation is very important. He is instructed to walk a great deal, because walking with the sponge in place improves circulation. Dressings are changed every two or three days, depending upon the amount of drainage present. After the ulcer has healed, if there is still some edema, the sponge is worn for a few weeks longer. The elastic bandage is worn for a still longer period.

Pain is a persistent symptom in a majority of chronic varicose ulcer cases. The division of the long internal saphenous nerve near the knee to relieve this pain was never helpful in my experience. Neither was vitamin B of much value. Sponge pressure treatment usually brought relief of pain within three weeks in a large majority of our patients.

If active fulminating infection is present in chronic ulcer, chemotherapy should be tried locally and internally, even though no specific germ could be isolated. Chemotherapy does not help in healing the ulcer, but it does lessen the morbidity.

The chronic ulcers almost always are secondarily infected with many organisms and are acutely inflamed. I have always taken a stand that the obliteration or ligation should be postponed until there is healing or in a stubborn case, there is at least a marked improvement. It is gratifying to find that at present there is unanimous agreement to this important fact in the surgical literature. This has minimized morbidity and made mortality a rarity.

Skin graft may be used in properly selected patients. Recurrence of ulcer following skin graft is not uncommon. I have observed a number of such patients during the last ten years. Until the circulation of the leg is adequate and the tissues return to normalcy, the grafts act like thin ice in a puddle of water.

Recurrence of varicose ulcer is common. Ligations whenever indicated and obliteration of all varicose veins assure the permanency of cure in a large majority of patients. There still remains a group where these methods fail.

Recurrence of ulcer in a patient who has had thrombophlebitis or phlebitis is most common. Patients should be instructed to wear an elastic bandage for an indefinite period, and exercise all care for the prevention of a recurrence.

The treatment of varicose eczema is unsatisfactory. Undoubtedly, many patients are benefited when venous insufficiency could be treated by injection and ligation. Elimination of associated epidermophytosis and allergic dermatosis may prove of help. The aim of our local treatment is to keep the eczema dry. Calamine lotion and an elastic bandage serve this purpose. Temporary improvement has been observed by x-ray treatment.

THE SURGICAL RISK IN ELDERLY PATIENTS

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IN 1850, individuals in the older age groups constituted about 2.5 per cent of the total population of this country. They now constitute about 5.5 per cent. In 1850, they numbered half a million. In 1950 it is estimated that they will number about 12,500,000, and in 1970 about 22,500,000. Those millions, as Brooks has pointed out, cannot lightly be eliminated from the field of surgery with the facile statement that they are too old for operation.

In other words, the question of surgery in the aged has become a matter of great practical importance. It is a particularly urgent problem at the present time. Modern war, with its callous disregard for all human life, including the lives of civilians, does not discriminate between youth and age when the bombs are dropping. We have no doubt that one of the medical results of this war will be the writing of a new, and we think a brilliant, chapter in the surgery of trauma in the aged.

Another question of practical importance must be answered in this connection. When is an individual really old? One's chronologic age, it is generally recognized, often bears no relation to one's age in terms of years. More fundamental considerations are the individual's physical status, the reserves which he can muster for an emergency, and other intangible factors, including his outlook upon life. "No one," as Bailey has remarked, "has the courage to designate the age which marks the end of usefulness," and that statement is now being illustrated before our eyes. Across the ocean a soldier, old in terms of years, is lifting the hearts of America and indeed of all the democratic world not only by his military genius but even more by his undefeated spirit and his gallant courage. We need not tell you that we are referring to the 62-year-old General Douglas MacArthur.

There is, however, a general and fairly well-founded belief that individuals of advanced age are as a rule poorer surgical risks than younger subjects. It is the purpose of this paper to estimate the magnitude of this supposed risk, to analyze the factors which contribute to it, and to determine what, if anything, can be done to control them.

As a background for this analysis we have reviewed the records

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of 100 consecutive patients over the arbitrarily chosen age of 60 years, who were submitted to 115 major surgical procedures. Their average age was 70 years, and 44 were males. Seventeen deaths occurred, a mortality of 17 per cent per patient and of 14.7 per cent per operation. Such a mortality, which is duplicated in many similar reported series, at first glance might make one question the wisdom of surgery in the older age groups. When the figures are broken down, however, that first impression is not substantiated. The breakdown can best be accomplished by considering under several headings the factors which might play a part in the mortality.

The patient's age we have already considered and need not discuss further except to point out that unlike some authors, such as Lawrence, we have not been able to make sharp differentiations between the risk in patients of 60 and 65 years and the risk in patients 70 years of age and over. Perhaps in a larger series such differences would be more apparent.

Surgical technic and technical errors should play no greater part in surgery of the aged than in any other surgery, assuming, of course, that the operation is performed by a competent surgeon who operates gently, rapidly, and with a strictly aseptic technic, and who adapts the procedure to the needs of the special case. In the 115 operations in this series there were 3 instances of excessive hemorrhage, and 1 instance each of accidental severance of the common bile duct, severance of the vas deferens, and perforation of the bladder. Fatal peritonitis followed the latter accident, but in no other case did the technical error affect the mortality.

Anesthesia needs no extended discussion. Local was employed in 37 instances, cyclopropane in 25, gas-ether in 23, spinal in 16, ether in 13, and intravenous anesthesia in 1. The spinal and local anesthesias were given by the operating surgeon, the inhalation anesthesias by a highly skilled anesthetist. We have found no one anesthetic of special advantage over another, and agree with other observers that the skill and care with which the agent is used, rather than the agent itself, is the thing that matters. We also believe it desirable to use the lightest narcosis compatible with complete relaxation. In this series no fatality was attributable to the anesthesia, and we observed no particular correlation between its duration and the mortality, although some observers, as for instance Lawrence, believe that such a correlation exists.

The most important of all factors which affect the mortality of surgery in aged subjects is obviously the nature of the disease, the discussion of which can be conveniently correlated with the discussion of another very important factor, the nature of the procedure.

Analyzing our material from this standpoint, we find:

1.—40 operations performed electively, with 2 deaths, 5 per cent.

2.—33 operations performed for emergency conditions, with 6 deaths, 18.1 per cent.

3.—27 operations performed for malignant disease in various locations, with 9 deaths, 33.3 per cent.

The differences in the mortalities in these various groups carry certain implications. Thus the difference between the 5 per cent mortality in the elective and the 18.1 per cent mortality in the emergency group is at least partially due to the longer time available in the former group for the detection and correction of complicating conditions, which implies, incidentally, well-balanced cooperation between the surgeon and a competent internist, who, preferably, already knows the patient and his troubles. The mortality of 33.3 per cent in the operations for malignant disease, as compared with a mortality of less than 11 per cent for the remaining 73 elective and emergency procedures, also carries its own lesson: In elderly patients, as in patients in other age groups, there is only one sure way to lower the mortality of carcinoma—earlier diagnosis, which in turn will permit earlier and more radical treatment.

What was lost by these 17 deaths? The 2 patients who died after elective surgery probably would have lived for years, though how many we cannot say, albeit in discomfort or in actual pain. As justification for the risk to which they were submitted, we would remind you of Moynihan's wise saying, that relief from suffering is frequently quite as important to the patient as rescue from impending death. The 6 patients who died after emergency procedures had conditions presumably incompatible with life, and it is fair to presume, if operation had not been done, a mortality of 100 per cent.

As to the group of patients with malignant disease, 6 of the 9 who died presented such hopelessly advanced disease that only exploration or some palliative procedure could be carried out, and they could not have lived much longer, with or without surgery. The other 3, because of the incurable disease from which they suffered, would inevitably have died also if surgery had not been instituted, though not, of course, so promptly.

An ethical problem cannot be ignored in the discussion of patients with malignant disease. They are truly the responsibility of the physician "until relieved by art or released by death," but at that, no one wishes to play the role of executioner. If careful study suggests that a surgical procedure could be nothing more than terminal,

then such relief as is possible should be accomplished by non-surgical means. On the other hand, to refrain from operation merely for the sake of a lower surgical mortality is reprehensible. Regardless of age, never should the slightest opportunity be missed to succor a patient who might be saved or relieved by surgery.

Another important point, emphasized by several writers on this subject, is that the mortality among elderly surgical patients is often due not to the operation itself, but to the fact that the patient was allowed to reach a serious or desperate state before operation was undertaken. We have pointed out elsewhere that few abdominal—or other—catastrophes are truly acute. Most of them represent rather an abrupt transition from a quiescent to an acute phase in a pre-existent disorder. The insidious character of the onset of many diseases in elderly individuals makes that point of special importance in this age group. Sometimes the delay is the fault of the patient or his family. Sometimes, regrettably, it is the fault of his physician, who hesitated to advise surgery because of the patient's age, although surgery as a last resort is even more undesirable in elderly patients than in patients in younger age groups.

The first step in the surgical approach to the elderly patient, once his condition is diagnosed, is the recognition of complications which are already present or which may be anticipated. When time permits, both the past history and the family history should be thoroughly investigated, to bring to light every possible weakness in the patient's physical or mental structure. It should be taken for granted that the mere act of living 60 years or more has imposed a strain upon the organism, and that every disease or accident or other untoward circumstance has left its additional mark.

Preoperative complications of some sort were observed in 60 of our 100 patients, and were classified as follows:

1. Cardiac, including such definite states as hypertensive or valvular disease, angina pectoris and congestive failure, as well as major abnormalities revealed by the electrocardiograph.

2. Hypertensive, with or without associated cardiac or renal disease.

3. Hepatic, including definite cirrhosis, and presumptive liver damage in long-standing biliary tract disease.

4. Renal, including such definite diseases as chronic nephritis, with or without edema, and impairment of function due to other causes, such as obstructing prostatic disease.

5. Nutritional, including marked malnutrition, anemia, cachexia, and avitaminosis.

6. Diabetes mellitus.

7. Miscellaneous states, including syphilis, tuberculosis, prostatic obstruction, marked oral sepsis, chronic infectious arthritis, advanced emphysema.

Paget's and Parkinson's disease, peptic ulcer, pathologic obesity, diaphragmatic hernia, psychosis, chronic bronchitis, and urinary tract infections.

The distribution of these complications, you will note, was fairly even in the three groups of operations, with two exceptions: 1. As might have been expected, nutritional complications were most frequent in the malignant group. 2. Cardiac disease was most frequent in the elective group, which contained a number of patients who had been observed over a considerable period of time and in whom proper management of a recognized cardiac lesion had led to sufficient improvement to warrant elective surgery.

Although 4 of the 30 patients with cardiac complications recognized preoperatively died, the mortality in this group was smaller than in any other group of complications, 13.3 per cent, and cardiac disease in itself was not the cause of a single death. Contrary to a fairly general belief, it seldom is the cause of death in a properly managed surgical patient. Butler, Feeney and Levine[4] some years ago analyzed the causes of 60 deaths which occurred in 494 operations performed on 414 cardiac subjects, and found the total mortality to be 12.1 per cent, but the unexpected mortality (exclusive of deaths from cardiac disease which would have occurred with or without operation) to be only 6.3 per cent. One of us (W.K.P.)[5] later compared the 60 deaths in this series with 60 postoperative deaths in noncardiac subjects and arrived at the conclusion that if the cardiac patient is properly treated, congestive heart failure is not a very significant factor in the causation of postoperative deaths. Fatal coronary occlusion and fatal pulmonary conditions, chiefly infection and pulmonary embolism, are, however, more likely to be present in cardiac subjects. These particular complications were not present in the cardiac subjects in our series. On the other hand, this series did confirm another conclusion arrived at in these two investigations, that the association of renal disease with cardiac disease materially increases the risk of the cardiac subject. This was particularly true in our group of emergency operations, in which time did not permit the study and preparation which such patients would ordinarily undergo.

It is significant that in this series hepatic failure carried the highest mortality of all (42.8 per cent) when the deaths were analyzed from the standpoint of preoperative complications. It was the sole cause or a contributing cause of death in one patient in the elective group, in whom a true hepatorenal syndrome was apparent, in one patient in the emergency group, and in two in the malignant group, the diagnosis being made by the appearance of jaundice and the clinical and laboratory evidence of hepatic disease, in several instances con-

firmed by the performance of various liver function tests and in two instances by necropsy.

It is curious that, so far as we can determine, none of the other writers on this subject emphasize or even mention hepatic failure as a possible cause of death in aged subjects. Boyce's[6] various studies have made clear that liver damage may exist in even the most unlikely subjects, and it would be entirely reasonable to assume, by analogy to the incidence of renal disease in individuals of advancing

TABLE 1

DISTRIBUTION OF 140 RECOGNIZED PREOPERATIVE COMPLICATIONS IN RELATION TO TYPE OF SURGERY

Group	Elective	Emergency	Malignancy	Total
Cardiac	17	9	4	30
Hypertensive	13	10	7	30
Nutritional	3	3	9	15
Renal	3	2	3	8
Hepatic	3	3	1	7
Diabetes		3	1	4
Miscellaneous	21	15	10	46

TABLE 2

DISTRIBUTION OF 140 RECOGNIZED PREOPERATIVE COMPLICATIONS IN RELATION TO MORTALITY

Complication	Number	Number Deaths	Percentage
Cardiac	30	4	13.3
Hypertensive	30	5	16.6
Nutritional	15	5	33.3
Renal	8	3	37.5
Hepatic	7	3	42.8
Diabetes	4	1	25.0
Miscellaneous	46	9	19.5

years, a similar incidence of hepatic impairment. It may be, as many authors claim, that none of the liver function tests now generally used is entirely satisfactory. That does not, however, relieve the surgeon of the responsibility of using them in spite of their imperfections. As Boyce has pointed out, and as the comprehensive comparative study of Mateer and his associates[7] has shown, the tests now available furnish a great deal of very useful information, and in our opinion they deserve a far wider use, because we believe that the liver is of far greater importance as a cause of postoperative mortality and morbidity than it is generally supposed to be.

Postoperative Care

The surgeon who operates on an elderly subject would do well to remember Bailey's dictum, that in advanced age more lives are saved by zealous preoperative and postoperative care than by the intervening surgical attack. Preoperative care we have already discussed. Certain phases of postoperative care should also be mentioned. Elderly patients sometimes tolerate pain poorly, and sometimes, because of a lower threshhold of sensibility, they tolerate it very well. Be this as it may, they withstand prolonged sedation very badly, and sedatives should therefore be given in as small doses as possible, for as brief a time as possible, and only when definitely indicated.

Aged subjects are peculiarly susceptible to respiratory complications and do not tolerate prolonged bed rest. They can be guarded against such complications by inhalations of carbon dioxide, and by the simpler method of frequent changes of position, the prompt assumption of the sitting or semi-sitting position, and limitation of the period of bed rest to as brief a time as possible. The fluid balance must be preserved, but fluids should be administered with due regard to possible deficiencies in the cardiovascular-renal system. Oral nutrition should usually be supplemented by intravenous feeding, and vitamins, especially B and C, should be added to the diet as necessary.

Finally, there must be taken into consideration a factor which cannot be analyzed statistically but which might be termed "sick-room psychology." Rowntree has expressed it very well: "Physically, treat [the aged subject] like a child, but mentally like an emperor." The attitude of both physicians and nurses should be that the patient is always right. His environment and his nurses should be exactly to his liking. His established habits, unless they are detrimental to his condition, should not be changed. His likes and dislikes in food, his smoking habits, his daily drink, should be humored as far as possible. Most important of all, a spirit of intelligent optimism should surround him on every side, for his will to live is the most fundamental part of his fight for life and health.

Conclusions

1. Because of the increasing proportion of elderly persons in the population, surgery in this age group is a matter of increasing importance.

2. Surgery in elderly subjects is associated with a somewhat higher risk than in younger subjects, but with proper precautions this risk can be reduced to reasonable levels.

3. Elective surgery in a properly prepared elderly patient should not carry a much higher risk than in any other age group. Emergency surgery carries a higher risk, chiefly because prolonged study and preparation are seldom possible. Surgery for malignant disease carries the highest risk of all, which could be promptly reduced if diagnosis were made earlier and operation carried out more promptly. Team-work between surgeon and internist will always improve the mortality, regardless of the nature of the disease or the character of the surgical procedure.

4. The preoperative recognition and treatment of associated complications will prevent many fatalities. In the 100 cases reported in this paper, nutritional, renal and hepatic complications were the direct cause of 11 of the 17 deaths, and played a minor part in several of the others. Cardiac complications are frequent, but seldom cause death in a properly prepared subject. Pulmonary complications can usually be prevented. If they cannot be, chemotherapy will reduce the mortality to an almost negligible figure. Hepatic complications are by no means infrequent and their importance should be more generally recognized.

5. The psychologic approach to the elderly surgical subject is intangible but nonetheless very important.

REFERENCES

1. Brooks, Barney: Surgery in Patients of Advanced Age, Ann. Surg. *105:* 481-493, (Apr.) 1937.
2. Bailey, F. W.: Surgery of the Aged, Am. J. Surg. *24* (n.s.): 487-500 (May) 1934.
3. Lawrence, W.: Management of Senile Patients for Anesthesia and Operation, Calif. & West. Med. *51:* 388-390 (Dec.) 1939.
4. Butler, S.; Feeney, N., and Levine, S. A.: The Patient with Heart Disease as a Surgical Risk: Review of 414 Cases, J. A. M. A. *95:* 85-91 (July 12) 1930.
5. Purks, W. K.: The Cause of Death of Patients with Organic Heart Disease Subjected to Surgical Operation, Ann. Int. Med. *7:* 885-894 (Jan.) 1934.
6. Boyce, Frederick F.: The Role of the Liver in Surgery, Springfield; Charles C Thomas, Publisher, 1941.
7. Mateer, J. G.; Baltz, J. I.; Marion, D. F.; Holland, R. A., and Yagle, E. M.: A Comparative Evaluation of the Newer Liver Function Tests (Comparison of the Intravenous Hippuric Acid Test, the Cephalin-Cholesterol Flocculation Test, the Colloidal Gold Test and a Serial Bromsulphthalein Test with the Oral Hippuric Acid Test and the Rosenthal Bromsulphthalein Test), Am. J. Digest. Dis. *9:* 13-29 (Jan.) 1942.
8. Rowntree, Cecil: Operative Surgery of the Aged, Clin. J. *60:* 257-261, (June 3) 1931.

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THE T TUBE

The T tube, the most popular type of tube employed in drainage of the common bile duct, consists of a long soft rubber catheter cemented at right angles to a shorter crosspiece of the same size and caliber. The originator of the T tube has never received the proper recognition for his ingenuity and it appears that the tube has been more or less taken for granted. Many surgeons have called it a Sullivan tube but neither Dr. Arthur Sullivan[1] of Madison, Wisconsin, nor Dr. Raymond Sullivan[2] of New York, was the originator, though both were among the first to popularize common duct drainage in this country. Dr. Rudolph Matas[3] credits Hans Kehr, a distinguished German surgeon, as the originator of the T tube. The tube was later modified by Dr. Will Mayo and has been known as the Kehr-Mayo tube. However, the use of any common duct drainage tube was not widespread until the very recent past. Lahey[4] has described the evolution of biliary surgery as having passed through three eras of development, namely: 1, cholecystostomy; 2, cholecystectomy, and 3, cholecystectomy plus choledochostomy. The statistics of almost any surgical group will show a marked increase in the frequency of exploration of the common duct.

The T tube may be obtained in various sizes from a No. 10 French to a No. 36 French or a 3.5 mm. to a 12 mm. range. The preferable material is a soft, black gum rubber for a hard, red rubber is more prone to crack or decay. Again, a soft rubber is more acceptable for it is less apt to cause any trauma at the time of removal. The longitudinal arm is 10 inches long and the transverse arm

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From the Department of Surgery, Touro Infirmary.
*In active military service.

measures 4 inches. However, the size of the tube employed should depend upon the estimated normal size of the individual common duct under consideration. Again, the tube is not used without the transverse arm being trimmed for this will greatly facilitate removal of the tube and does not impair the drainage efficiency. The transverse arm should not be over ½ to 1 inch after trimming. It is also desirable to bevel the edges at this time. The longitudinal arm is not disturbed and is sufficiently long to accommodate an abdomen of any depth. This arm is attached to a receptacle on the outside of the abdomen.

The T tube is one of several types of common duct drainage tubes, the principal competitors being an ordinary catheter, a Y shaped tube and an L shaped tube. The advantages of the T tube over the catheter are several in number, namely: the T tube is not as prone to slip out of the duct as is true of a Y tube. The L tube is mentioned but does not possess any virtues that make it eligible for further consideration. The T tube passes in both directions, towards the hepatic duct and towards the duodenum, draining freely and yet not interfering with the normal direction of flow. However, by merely clamping the longitudinal arm of the T tube, one can reestablish the flow of bile back into the intestinal tract without difficulty and can ascertain whether or not any obstruction remains. The catheter does not possess this advantage. The Y tube can be utilized in the same manner but the possibility of leakage about a Y tube appears to be greater than with a T tube. Lastly, the T tube may be employed for further diagnostic purposes by means of cholangiography, whereas a catheter does not lend itself so readily to such a procedure.

The common duct should be drained, in the opinion of most surgeons, every time the duct is opened, whether this be for exploration and removal of calculi, irrigation of the duct, dilatation of the sphincter of Oddi or a plastic reconstruction on the duct. Ever so rarely some surgeon will advocate non-drainage with a primary closure of the duct. This is not new as Halsted[5] mentioned such a procedure over fifty years ago. One very strong argument in favor of drainage is the fact that instrumentation of the duct may cause edema and thereby obstruction or a spasm of the sphincter of Oddi may result with a similar effect. In such instances, drainage is of inestimable value.

The T tube is placed in the common duct at the site of the exploring incision into the duct. However, this site varies in many instances, dependent upon the particular case involved. If one wishes to extract an impacted stone from an accessible portion of the com-

mon duct, the incision is usually over the site of impaction. If the incision is for exploration and dilatation of the sphincter of Oddi and the site is more or less elective, it is better to make the incision low down on the duct; in so doing one must be careful that the T tube does not rest immediately upon the duodenum, causing a pressure necrosis that could result in a duodenal fistula being formed. This danger appears to be more theoretical than actual but none the less caution should be exercised. There is no danger of an ascending cholangitis if the tube is properly placed, for the transverse arm does not pass into the duodenum.

The T tube is fixed in the common duct by interrupted sutures, preferably of an unabsorbable material as silk or cotton on an atraumatic needle. The tube per sé is not transfixed with a suture. The tube is brought outside of the abdomen through an angle of the original abdominal wall incision or through a stab wound in the right flank. The latter method is most probably the one of choice with most surgeons. Glenn[6] states that it is better not to fix the T tube to the skin or to the dressing for changing positions of the intra-abdominal organs, plus changes in intra-abdominal pressure, require leeway for adjustment to new positions. However, I have never regretted fixing a T tube to the skin in many instances and think that fixation to the skin is elective.

The question that is most frequently asked about a T tube is "How long should one leave the tube in place before removing it?" There is no standard answer for every case is a law unto itself. There is no tendency toward stricture formation or erosion in the common bile duct by prolonged contact with a rubber drainage tube. Many surgeons are empirical and permit the tube to remain in situ for twelve to sixteen days. This is most emphatically not a safe method to employ. The duration of drainage is dependent upon the following factors:

1. Size of the common bile duct at the time of operation.

If the duct has been distended over a prolonged period of time and is very large with considerable fibrous tissue present in its walls, a period of time sufficient to permit the duct to regain its tone should elapse before withdrawing the T tube. This may be as long as eight to ten weeks in some instances. The return of the duct to a normal size may be checked by serial cholangiograms. If the common duct was not dilated at the time of operation, then this factor is negligible.

2. Character of the bile.

The color, consistency, and chemical composition of the bile are valuable indices as to the functional status of the liver. When obstruction has been present, one frequently notes a thick tenacious, black bile present. Once the obstruction has been released, the gross appearance of the bile tends to return

to normal with time. Ravdin has demonstrated that obstruction in the biliary tract inhibits the formation of bile acids in the bile. When the bile acids return to normal, one may infer that the hepatic parenchyma has sufficiently recovered and that drainage need not be continued. One criterion that is frequently employed is that the tube may be removed when the bile cholsterol equals the blood cholesterol.

3. Clamping of the T tube.

After the tube has been draining for eight to ten days and the patient appears to be convalescing smoothly, it may be clamped for increasing periods of time until it is clamped continuously for five to seven days. The color of the stools should be noted but more important is whether or not the patient experiences any pain during this period; if so, one may surmise that some obstruction may still be present and further investigation is necessary.

4. Cholangiography.

Cholangiography was first introduced by Cotte[7] in 1925 and popularized in this country by Hicken, Best and Hunt[8]. This is very important and should be routine before the T tube is withdrawn. This procedure is a safeguard against overlooking remaining calculi in the common duct. It also gives an accurate index as to the size of the common duct and the functional status of the sphincter of Oddi. The contrast substance employed at Touro Infirmary is lipiodol. A 48 per cent solution of hippuran is also satisfactory. The dye should pass into the duodenum within ten minutes.

The care of the tube while drainage is being carried out is very simple. The bile should be collected in a 24 hour period and its color and consistency noted. Cholesterol determinations of the blood and bile should be made at regular intervals so as to determine the "comeback" power of the liver parenchyma. If the tube becomes blocked, and this is rare, usually being due to deposits of bilirubin and other salts on the transverse arm within the duct, one should irrigate the tube with a warm solution of 5 per cent sodium carbonate which dissolves such deposits. This difficulty occurs only when it is necessary to permit the tube to remain in place over a period of many weeks.

When a stone is located in the common duct by delayed cholangiography, Best and Hicken[9] have advocated the following regime over a period of three days in an effort to dislodge the stone.

On the first day a 1/100 grain tablet of glyceryl trinitrate is placed under the tongue three times during the day; on the second 1/100 grain of atropine is given either by mouth or hypodermically three times, and on the third day the administration of glyceryl trinitrate is repeated. Each morning the patient is given 2 drachms (8 Gm.) or more of magnesium sulphate in warm water and each evening at bedtime one ounce (30 c.c.) of olive oil (preferably) or thick cream. The common duct is gently irrigated once a day through the T tube with warm physiologic solution of sodium chloride and after as much of this as possible is removed by syringe or by permitting the tube to drain for five minutes, from 10-30 c.c. of warm sterile olive oil or lipiodine is instilled

into the common duct. If the patient does not complain of distress, the tube should be clamped off during this course of treatment except for a 30 minute period after each instillation. In order to maintain an increased intraductal pressure, three or four tablets of decholin or procholan are given four times a day.

This method is a very conservative one and in some instances will avoid the necessity of re-operation.

The tube is removed by gentle traction. No force is necessary. A small amount of bile stained drainage will follow for from several hours to two or three days. However, no difficulty is experienced with wound healing.

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REFERENCES

1. Sullivan, Arthur: Personal communication to the author.
2. Sullivan, Raymond: Personal communication to the author.
3. Matas, Rudolph: Personal communication to the author.
4. Lahey, H.: Common and Hepatic Duct Stones, Am. J. Surg. *40:* 209-216 (April) 1938.
5. Halsted, W. S.: The Omission of Drainage in Common Duct Surgery, Surgical Papers, *2:* 472.
6. Glenn, F.: Exploration of Common Bile Duct, Ann. Surg. *112:* 64-79 (July) 1940.
7. Cotte, G.: Demonstration of Calculus in the Ampulla of Vater by Lipiodol Injection of a Biliary Fistula, Lyon Chir., *22:* 691-697, 1925.
8. Hicken, N. F.; Best, R. R., and Hunt, H. B.: Cholangiography. Visualization of the Gall Bladder and Bile Ducts During and After Operation, Ann. Surg. *103:* 210-229 (Feb.) 1936.
9. Best, R. R., and Hicken, N. F.: Non-operative Management of Remaining Common Duct Stone. J. A. M. A. *110:* 1257-1261 (April 16) 1938.

BOOK REVIEWS

The Editors of THE SOUTHERN SURGEON *will at all times welcome new books in the field of surgery and will acknowledge their receipt in these pages. The Editors do not, however, agree to review all books that have been submitted without solicitation.*

CARCINOMA AND OTHER MALIGNANT LESIONS OF THE STOMACH. By WALTMAN WALTERS, B.S., M.D., M.S. in Surgery, D.Sc., F.A.C.S., Surgeon, Mayo Clinic; HOWARD K. GRAY, B.S., M.D., M.S. in Surgery, F.A.C.S., Surgeon, Mayo Clinic; JAMES T. PRIESTLEY, B.A., M.D., M.S. in Experimental Surgery, Ph.D. in Surgery, F.A.C.S., Surgeon, Mayo Clinic, and Associates in the Mayo Clinic and Mayo Foundation, Rochester, Minnesota. 576 pages, with many illustrations. Price, $8.50. Philadelphia and London: W. B. Saunders Company, 1942.

The late great John B. Murphy once introduced a paper on appendicitis with a remark to the effect that, although many papers had already been presented on that subject, it was just the time to begin talking about appendicitis. The same thing now applies to cancer of the stomach.

This new book from the Mayo Clinic presents a well rounded picture of malignant lesions of the stomach that have been observed there: prior to January 1, 1935, there were 9441 cases; since, 2020. Of the former group one in four was resected and the almost perfect follow-up of these cases over a period of at least five years is most informative. Of statistics there is an abundance. One must be content to quote only two: of those patients who survived resection of carcinoma of the stomach by as much as seven years, the death rate is closely parallel to that of the general population. The discussion of the interpretation of statistics is not the least valuable part of the book. Although the mortality is highest in patients whose symptoms have been present less than a year (partly because of the high malignancy of many, partly because sometimes the neoplasm arose in a silent area of the stomach and was therefore far advanced before being discovered). At the same time it is stressed that in each case the earlier the diagnosis the better the outlook.

One must not gather the idea that the book is composed of statistics alone. Neither should one believe that, although the book was prepared by three surgeons, it is purely a surgical treatise: indeed surgical technic is not even broached in the first half of the book. The authors have called on numerous colleagues for chapters.

After a historical review, several chapters are devoted to diagnosis: the most important factor of course is roentgenology, but gastroscopy and intragastric photography are also described and evaluated. A sterling chapter deals with the physiologic consequences of gastric carcinoma and of gastrectomy; in the two on pathology the importance of the grade of malignancy of the cancer is again brought out.

There is an excellent discussion of the preoperative treatment. It is unnecessary to say that the chapters dealing with the various technical procedures of resection are clearly written and superbly illustrated. It is pointed out that a surgeon cannot confine himself to one method of excising carcinoma of the stomach: he must be ready to employ the means best suited to the case at hand. Of the seven types of operation the order of frequency is posterior Polya, anterior Polya, Billroth-II, Billroth-I, local excision, segmental excision and total gastrectomy. It is however impossible, on account of the many factors involved, to say that one type carries in general either the lowest operative mortality or the best chance of permanent cure.

One is interested to note that these surgeons lay great emphasis on the importance of psychic considerations in the treatment of patients following partial or complete resection of the stomach.

In short this book is a most valuable review of a large number of cases of carcinoma of the stomach, studied from various angles by one group of men over a period of about forty years, in the light of the studies of other surgeons throughout the world. Although not every surgeon is interested in performing partial gastrectomies, indeed not every surgeon is competent to do so, he, as well as his medical confreres, should have access to this gold mine of information.

SURGICAL PHYSIOLCGY. By JOSEPH NASH, M.D., Assistant Professor of Clinical Surgery, New York University College of Medicine; Associate Visiting Surgeon, Bellevue Hospital, New York City; First Lieutenant, Medical Corps, U. S. Army, Assistant Chief of the Surgical Service, Lovell General Hospital, Fort Devens, Massachusetts. 496 pages. Price, $6. Springfield: Charles C Thomas, 1942.

In his preface the author states that he considers his book an answer to meet the demand for a presentation of physiology which is adapted more to a surgeon's needs than to those of an internist. The book is divided into seven sections, each concerned with some vital arrangement of organs within the human body. Since he considers circulation and respiration to be the two "most vital" systems, he presents his discussion of circulatory and respiratory phenomena first.

The circulatory system is made up primarily of the heart, blood vessels, and the blood itself. He considers briefly, but in sufficient detail and without the theoretical red tape which crowds most accepted physiology texts, the various factors entering into the maintenance of a normal circulation, and the aberrations and modus operandi of these. Thus he discusses such things as the depressor and carotid sinus reflexes, the medullary centers, the pH of the blood, rate of circulation, Rouget cells, peripheral resistance, viscosity and volume of the blood, and other physical components easily understood or even recalled in some detail when brought to mind. There is a good discussion of the pathologic physiology of surgical shock and its proper treatment. Hemoconcentration following burns, functions of the reticulo-endothelial system, pneumothorax, transportation of oxygen and carbon dioxide of the blood, the sneeze reflex, the cough reflex, and even the hiccup are considered. Little of importance or of interest to the intellectually curious is omitted.

Factors influencing body surface temperature in health are either external or internal. External factors are temperature, humidity, wind and clothing; while internal factors are basal metabolic rate, muscular work, and surface blood supply. Nervous chemical and physical mechanisms governing the internal factors are discussed. Causes of fever are listed as (1) the action of protein and products of protein decomposition on the heat center, (2) dehydration interfering with heat loss, and (3) brain lesions, affecting the heat center. It is of interest to note that fever associated with hemorrhage seems to depend mainly on disintegration of the blood platelets. It is of further interest to note that the average surface temperature at the base of the great toe is 29.2 C.

One may read about the alimentary system with all of its chemistry, movements and noises.

Body fluids, water balance, osmotic relationships, sweat, acid-base equilibrium the endocrine glands, the cerebrospinal nervous system, and interrelationships of all these things take their places in the book.

There are 496 pages, author and subject indices, a complete bibliography and numerous charts, graphs and diagrams.

H. H. T.

ARTHRITIS IN MODERN PRACTICE: THE DIAGNOSIS AND MANAGEMENT OF RHEUMATIC AND ALLIED CONDITIONS. By OTTO STEINBROCKER, B.S., M.D., Assistant Attending Physician and Chief, Arthritis Clinic, Bellevue Hospital, Fourth Medical Division, New York City. *With Chapters on Painful Feet, Posture and Exercises, Splints and Supports, Manipulative Treatment and Operations and Surgical Procedures* by JOHN G. KUHNS, A.B., M.D., F.A.C.S., Chief of the Orthopedic and Surgical Service, Robert Brack Brigham Hospital; Assistant Visiting Orthopedic Surgeon, Boston Children's Hospital. 606 Pages, with 321 illustrations. Price, $8. Philadelphia and London: W. B. Saunders Company, 1941.

This is a fine book.

It begins with a discussion of the ubiquity of "rheumatism": though it seldom kills, it causes untold morbidity; indeed, dissociating "heart disease" and "arteriosclerosis and high blood pressure" (which this reviewer cannot do), it is the most common cause of disability in the U. S. A. today. It seems that there are more than ten times as many cases as there are of tuberculosis in all its forms. And, one fears that the average doctor welcomes a "neuro" more than an arthritic.

After the introductory chapters there is an excellent discussion of rheumatoid arthritis. The author believes that adequate early treatment will often ameliorate if not arrest such conditions. One must remark on the excellent common sense in this chapter.

Further chapters take up other affections of the joints and the causes of pain in the musculoskeletal system. It includes chapters on surgical treatment.

It's hard to see how any doctor could fail to see patients such as described in this book, and certainly most of them could treat them better with the information and advice contained.

NEUROANATOMY. By FRED A. METTLER, A.M., M.D., Ph.D., Professor of Anatomy, University of Georgia School of Medicine, Augusta, Georgia. 476 pages, with 337 illustrations, including 30 in color. Price, $7.50. St. Louis: The C. V. Mosby Company, 1942.

This book is designed for the undergraduate. The first section considers gross anatomy. The author states "In those fields in which repeated evidence of deficient training on the part of clinical clerks or internes has been encountered, a special effort has been made to clarify the general principles involved." The second part of the work is devoted to the histology of the nervous system. In this an attempt is made to establish a sound and usable functional viewpoint.

The book is well organized and clearly written. There is an extensive bibliography, with special reference to standard American journals to facilitate

access to them by the student. However the most striking thing about it is the wealth of superb illustrations. Some of the schemata have been borrowed from standard works, but redrawn to fit the style of this work. All of the drawings of specimens (to our great relief) are brand new. They were made from original material dissected or otherwise prepared by the author. The drawings from the gross are by Ivan Summers, the microscopic work by Robert C. Adams. Incidentally great care has been taken to arrange the cuts conveniently. The freshness of this text and excellence of its general make-up should endear it to student and teacher alike.

COLLECTED PAPERS OF THE MAYO CLINIC AND THE MAYO FOUNDATION. Edited by RICHARD M. HEWITT, B.A., M.A., M.D.; A. B. NEVLING, M.D.; JOHN R. MINER, B.A., Sc.D.; JAMES R. ECKMAN, A.B., and M. KATHARINE SMITH, B.A. Volume XXXIII, 1941, published May, 1942. 1099 pages. Price, $11.50. Philadelphia and London: W. B. Saunders Company, 1942.

As last year the 1941 volume from the Mayo Clinic opens with an extensive section on aviation medicine. Every article is worth reading carefully. Indeed they proved so fascinating to this reviewer that he had to skim rather lightly over some of what followed.

It may be remarked again that of the large literary outpouring from Rochester, less than 10 per cent is reproduced in full; a slightly larger percentage is presented in abridgment and another 10 per cent in abstract. It is impossible to exaggerate the importance of this selection. It is valuable both because none of us take all the medical journals,—and because sometimes we overlook valuable papers in those we do receive. This selection embraces material to interest every physician whatever his chief interest.

The section on the alimentary tract leads off with a comprehensive discussion of benign lesions at the lower end of the esophagus. George Eusterman's paper, "Carcinomatous Gastric Ulcer: Misleading Results of Medical Therapy" is already recognized as a classic. It should be studied at least once a year by everyone, surgeon or internist, who treat patients with gastric disorders. The content of papers on the ever timely subject, cancer of the stomach, is incorporatd in another volume from the Clinic reviewed above. Brown's "Suggestions as to Diet in Certain Gastrointestinal Conditions" is important: too many of us either hand out ready made diet list to our patients or have our secretaries or a dietician discuss diet with them; or we may ride our own hobbies to death.

The papers on the liver are stimulating. One may note that "omentopexy for ascites has proved to be a failure." One more operation deleted from the realm of surgery! On the other hand the pancreas is now a surgical organ. Regional ileitis in recent years has received attention in Rochester.

The genitourinary organs are introduced with "Prognosis in Bilateral Renal Lesions." Braasch concludes that a unilateral "surgical" lesion in the kidney is responsible for less than 1 per cent of cases of hypertension. This would indicate that the enthusiasm for nephrectomy in the treatment of hypertension has been somewhat too great. On the other hand, he and Walters admit that in some suitable cases it works. Gershon Thompson's paper on carcinoma of the prostate, which appeared in THE SOUTHERN SURGEON last year, is included.

Goiter surgery does not seem to have been advanced. The cardiovascular

section is excellent, but hardly requires comment here, but the discussion of shock, and the investigations of serum proteins and plasma are valuable,—especially now.

Figi believes that the pendulum has swung too far to the radical side in the treatment of carcinoma of the larynx. He presents figures in favor of more frequent thyrotomies with much more liberalism in the selection of cases for such operations. This is rather surprising for Chevalier Jackson, who advocated laryngofissure as an almost ideal operation in the first volume of this journal has more recently been less severe in his condemnation of total thyroidectomy. It would seem we are now approaching the happy medium.

Hench presents an excellent discussion of those too neglected subjects, arthritis and rheumatism.

In the section on the chest, Harrington writes of pneumonectomy for cancer of the lung, as well as on diaphragmatic hernia. In the latter condition he has had a very much wider experience.

It is impossible to mention every good paper, even those strictly surgical. One must be content to say that the study of this book is a pretty good substitute for a general postgraduate course. And we may add that he still misses those distillates of wisdom and experience of Doctor Will and Dr. Charley, which after they ceased to write strictly scientific papers added so much to season the annual volume.

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